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BOWLING'S
ARITHMETIC
& MENSURATION

A COMPLETE

COURSE OF QUESTIONS

IN

ARITHMETIC & MENSURATION,

FOR THE USE OF

SCHOOLS AND PRIVATE STUDENTS.

BY

RICHARD BOWLING,

MILK STREET SCHOOL, SHEFFIELD.

SHEFFIELD: HENRY PAWSON.
LONDON: SOLD BY SIMPKIN, MARSHALL, AND CO.
1858.

181. c. 7.

IN A SHORT TIME WILL BE PUBLISHED,

BY THE SAME AUTHOR,

A KEY TO THE QUESTIONS

CONTAINED IN THIS WORK,

EMBRACING NOT ONLY THE ANSWERS TO THE WHOLE, BUT ALSO, IN A CONDENSED FORM, THE WORKING TO MANY OF THEM.

BIBLIOTHECA · BODLEIANA

PREFACE.

Among the various branches of study pursued by youths, no one is of more importance than a practical acquaintance with Arithmetic; and judging from experience, few are more superficially studied. One of the causes of this slight acquaintance with what cannot be too thoroughly understood, is, in my opinion, the custom of youths working for a length of time *exclusively* in one rule, then passing on to another, which is worked in the same way, and so on through the book: the great evil of this system is, that the pupil acquires a habit of working mechanically; a process which evades very materially any effort of the *thinking power*, without which, all working in Arithmetic, as in every other branch of study, is utterly worthless as a source of *mental* training. To counteract this evil is the principal object I have had in view in composing and arranging the following work; and as it is the result of an experience of many years' teaching, and the great majority of the questions were composed expressly to meet the difficulties which youths find in working the various rules, I feel the greatest confidence in placing it in the hands of gentlemen engaged in teaching Arithmetic and Mensuration, being assured that it will be to them, what it has been to me, a valuable help in inducing their students *to think*, which is the principal object a teacher will always have in view.

The Questions are arranged on the principle that as soon as a youth understands a rule he should cease working *exclusively* in it, and occupy himself with every rule from the commencement of the work to the end of that rule. To enable him to pursue this course, I have given numerous examples under each rule, that he may be able to ***understand thoroughly the principle of it;*** but at stated periods I have introduced examination papers, embracing every rule from the commencement of Arithmetic to the close of that rule. These examination papers, which constitute the peculiarity of the work, will be found of invaluable service to the student, as they embody all the rules which he has worked, but do not contain a single question that is beyond his power, if he exert himself; as it was not my object to try *to puzzle him*, but to use such plainness of language that the questions might be easily understood, and yet be such as should tend directly to his improvement; and when he has gone through the course of Arithmetic here presented to him, he will be prepared to understand and appreciate the beautiful reasoning of Euclid, which should be placed in his hands on his commencing the study of Mensuration, that his acquaintance with it may keep pace with his progress in that very useful part of a practical Education.

Milk Street School,
Sheffield, January, 1858.

QUESTIONS IN ARITHMETIC.

NOTATION AND NUMERATION.

Express in Figures—

1 Fifty-seven.

2 One hundred and thirty-two.

3 Seven hundred and five.

4 Two thousand one hundred and eighty-nine.

5 Five thousand and nine.

6 Thirty-seven thousand and sixty-three.

7 Sixty-nine thousand, four hundred and ten.

8 Forty-four thousand, and two.

9 One hundred thousand, and one.

10 Seventy thousand, and sixty-six.

11 Six hundred and fifteen thousand, and nine.

12 One million, two hundred and sixty-three thousand, seven hundred and fourteen.

13 Three millions, three thousand, and three.

14 Twenty-nine millions, eight hundred and fifty-four thousand, six hundred and seven.

15 Ten millions, and three.

16 Ninety-five millions, two thousand, and nine.

17 Eight thousand, and thirty-eight.

18 Sixty millions, seven hundred and three thousand, four hundred and twenty-one.

19 Fourteen millions, fourteen thousand, and fourteen.

20 Seven hundred and ninety-six millions, six hundred and fifty-three thousand, four hundred and ninety-five.

Express in words—

1 74
2 704
3 4704
4 7499
5 9007
6 40117
7 20019
8 147647
9 20104
10 47039
11 7004709
12 123456789
13 940009
14 10010019
15 674079
16 20000002
17 417418697
18 2600742
19 18647409
20 700401001

SIMPLE ADDITION.

1 746+9479+42+42798+423
2 4987+74296+26+9879+74356
3 247+42987+64+428+79989
4 9497+69496+709+5436+62439
5 526+475+6498+429+98749
6 4737+94+749+9879+24896
7 949+8376+4798+59874+749
8 4276+649+973+94956+4738
9 686+7843+949+4739+9768
10 749896+26+8987+4976+26+249+98742+64989+748
11 4986+98799+7436+598798+26+4277+89079+947389
12 874+4799+94998+26+427+943759+4268+749+84768
13 7986+427+94989+73+576+49798+947998+743+74896
14 8674+423+4998+74986+643+49879+6785+49869
15 9789+26279+57+26897+499+7856+49837+26987
16 269+9547+87989+436+94789+210426+537+7654
17 6478+473+94798+4759+86295+46+749+98786
18 26+2987+478+94986+6478+259+7862+264+4787
19 4796+689+7496+427+64+587+4987+26476+6479
20 743+4987+7654+426+84769+987654+53+8476

SIMPLE SUBTRACTION.

1 74700964—1864937
2 846214734—6478957
3 72010732—219864
4 647314869—1749467
5 47326142679—247864289
6 94101020304—123456789
7 6543210426—417416954
8 147186947—24680135
9 742864965—654321796
10 87438647—14674186
11 96543749—71498967
12 6547310969—4274156
13 98574986—19869876
14 123456789—98765532
15 9497102113—65467896
16 410765432—24678746
17 5423104286—43718649
18 67101420110—142314678
19 4237468146—734186473
20 1234567471—758647496

SIMPLE MULTIPLICATION.

1 749869726 × 2
2 473698437 × 3
3 674989746 × 4
4 4897645 × 5
5 79898976 × 6
6 91478947 × 7
7 846497846 × 8
8 94374798 × 9
9 42642749 × 11
10 947864129 × 12
11 7647489 × 13
12 494867 × 14
13 8478969 × 749
14 479809 × 74089
15 64187498 × 24009
16 914731496 × 74804
17 47314874 × 67804
18 91472356 × 47907
19 919879684 × 76405
20 7498739 × 98706

SIMPLE DIVISION.

1 7986946 ÷ 2
2 194718647 ÷ 3
3 147864678 ÷ 4
4 274698496 ÷ 5
5 794674986 ÷ 6
6 142734697 ÷ 7
7 4796478946 ÷ 74
8 6474786943 ÷ 43
9 9876543216 ÷ 248
10 4796847469 ÷ 725
11 9874946743 ÷ 847
12 47387624746 ÷ 9418

13 746847481694÷47186
14 8647418694826÷91487
15 417314741643129÷437567
16 491473847314116÷174986
17 1798764186948÷179946
18 47869410011009÷471795
19 111000110011001÷141777
20 123456789123456÷987654

COMPOUND ADDITION.

£. s. d. £. s. d. £. s. d. £. s. d.
1 749 14 6¼ + 14 14 6½ + 9 17 8½ + 26 19 8¾
+ 98 17 4¼ + 87 16 11¼
2 476 17 6½ + 749 16 6¼ + 9 14 5½ + 4789 19 8¼
+ 9479 19 11½ + 27 17 6½
3 7498 17 6½ + 426 14 7¼ + 26 16 11½ + 26 19 11¼
+ 4789 11 10¾ + 437 14 4¼
4 26 14 6½ + 149 17 4¾ + 43 17 4½ + 847 17 11¾
+ 9487 10 6½ + 914 6 8¾
5 749 16 4½ + 2694 11 2¼ + 94 4 2½ + 4798 11 7¼
+ 799 19 11½ + 479 16 7¼
6 986 17 4½ + 4799 14 6½ + 476 11 4½ + 26 19 11¾
+ 947 19 4½ + 9879 4 6¼
7 4749 14 6½ + 69 17 7¾ + 7 10 9¼ + 64 19 11¾
+ 7989 19 11½ + 7498 7 6¾
8 274 14 6¾ + 94 14 7¾ + 26 14 7¼ + 7498 17 7½
+ 749 16 4½ + 789 19 11¾
9 9875 12 4½ + 456 17 8¾ + 9 14 6½ + 24 19 11½
+ 7489 19 11¼ + 47 11 11¾
10 74 14 4½ + 698 14 6½ + 12 13 7¼ + 989 11 11¾
+ 79 17 10¼ + 986 17 4½

TROY WEIGHT.

lbs. ozs. dwts. lbs. ozs. dwts. lbs. ozs. dwts. lbs. ozs. dwts.
11 17 11 19 + 14 11 14 + 74 9 13 + 94 9 11 +
76 4 16 + 14 11 15
12 94 6 11 + 26 4 13 + 17 4 14 + 126 11 19 +
74 10 14 + 99 7 15
13 94 4 11 + 64 7 14 + 98 11 17 + 749 10 4 +
986 11 19 + 747 10 19

lbs. ozs. dwts. grs. lbs. ozs. dwts. grs. lbs. ozs. dwts. grs.
14 7 11 11 20 + 9 4 16 21 + 4 6 14 17 +
19 7 14 22 + 77 11 17 9 + 11 7 19 14

lbs. ozs. dwts. grs. lbs. ozs. dwts. grs. lbs. ozs. dwts. grs.
15 64 9 7 4 + 14 7 7 19 + 7 10 17 7 +
7 4 14 21 + 9 10 9 14 + 14 7 4 18

AVOIRDUPOIS WEIGHT.

lbs. ozs. drs. lbs. ozs. drs. lbs. ozs. drs. lbs. ozs. drs.
16 19 14 13+ 26 11 10+ 94 4 4+ 74 11 11+
74 14 15+ 7 11 11
17 94 7 14+ 87 11 15+ 49 9 9+ 64 6 13+
49 14 11+247 4 13

Tons. cwts. qrs. lbs. Tons. cwts. qrs. lbs. Tons. cwts. qrs. lbs.
18 17 19 3 17 + 94 4 1 19 + 4 1 1 17 +
94 7 1 14 + 47 16 2 26 + 19 17 2 16
19 14 14 2 25 + 68 17 1 14 + 17 14 3 4 +
16 16 3 27 + 94 14 3 19 + 19 16 1 9
20 94 7 0 16 + 79 19 2 21 + 74 7 1 19 +
42 14 1 11 + 86 14 1 12 + 18 4 2 11

APOTHECARIES' WEIGHT.

Drs. scrs. grs. Drs. scrs. grs. Drs. scrs. grs. Drs. scrs. grs.
21 79 1 17 + 76 2 19 + 67 2 11 + 46 1 19+
85 1 17 + 43 1 12
22 94 2 12 + 24 2 12 + 84 1 16 + 71 1 14+
36 2 16 + 35 1 15
23 27 1 7 + 42 1 12 + 94 2 12 + 42 1 11+
59 2 19 + 86 1 13

lbs. oz. drs. scrs. lbs. oz. drs. scrs. lbs. oz. drs. scrs. lbs. oz. drs. scrs.
24 72 4 2 2+56 9 3 1+69 2 2 1+16 9 5 1+
42 2 4 1+96 5 4 1
25 77 6 4 0+49 11 4 1+17 6 2 2+34 2 7 1+
54 10 5 2+92 9 4 2

CLOTH MEASURE.

Fr.ells. qrs. nls. Fr.ells. qrs. nls. Fr.ells. qrs. nls. Fr.ells. qrs. nls.
26 94 4 1 + 79 4 2 + 42 5 2 + 26 3 3 +
29 5 1 + 55 1 1
27 78 5 2 + 68 2 3 + 87 3 1 + 89 2 2 +
47 3 2 + 79 3 3

E.ells. qrs. nls. E.ells. qrs. nls. E.ells qrs. nls. E.ells. qrs. nls.
28 76 4 1 + 26 1 2 + 48 3 1 + 92 3 2 +
37 4 3 + 55 4 2
29 47 1 2 + 86 2 1 + 67 1 2 + 54 2 1 +
74 3 2 + 79 4 3

Yds. qrs. nls. Yds. qrs. nls. Yds. qrs. nls. Yds. qrs. nls.

30 24 2 3 + 72 1 2 + 46 1 2 + 37 3 3 +
45 3 1 + 39 2 3

LONG MEASURE.

Yds ft. in. b.cns. Yds. ft. in. b.cns. Yds. ft. in. b.cns. Yds. ft. in. b.cns.

31 17 1 7 1+26 2 7 0+59 1 11 1+42 2 6 2+
39 1 2 2+92 2 2 1

32 68 2 8 2+84 1 6 2+59 2 7 2+72 2 7 2+
77 2 1 1+98 2 4 2

33 26 1 6 1+92 2 6 1+43 1 6 0+18 2 4 1+
27 2 7 2+79 1 8 2

Deg. mi. fur. po. Deg. mi. fur. po. Deg. mi. fur. po. Deg. mi. fur. po.

34 84 29 4 37+73 57 5 17+62 18 2 19+99 47 6 26+
69 39 7 19+41 47 5 27

35 24 55 4 17+67 29 4 12+22 8 1 18+47 47 7 13+
53 32 3 27+57 7 7 19

COMPOUND SUBTRACTION.

	£.	s.	d.	£.	s.	d.
1	74986	14	7¼—	9843	12	6¾
2	947486	11	8½—	47376	16	11¾
3	741874	14	2½—	69479	17	7½
4	673524	10	4¼—	7984	11	9¾
5	847494	4	2 —	6987	7	5½
6	949748	2	6½—	73498	14	6¼
7	4101701	11	4¾—	20174	12	9½
8	8765413	17	6½—	14749	12	8¾
9	428701	10	2 —	7478	12	4½
10	9871043	14	5½—	898467	19	8¾

SQUARE MEASURE.

	A.	r.	p.	A.	r.	p.
11	749	3	17—	248	2	19
12	846	1	19—	179	3	20½
13	700	0	0—	534	1	16¼
14	694	1	26—	219	2	27
	S. yds.	**ft.**	**in.**	**S. yds.**	**ft.**	**in.**
15	917	5	47—	874	5	68
16	2147	4	58—	748	7	114

WINE MEASURE.

	Hhds.	gals.	qts.	pts.		Hhds.	gals.	qts.	pts.
17	949	17	3	1	—	470	19	1	1
18	741	0	1	0	—	478	26	2	1

	Tierces.	gals.	qts.	pts.		Trcs.	gals.	qts.	pts.
19	701	18	1	0	—	496	31	1	1
20	4107	36	2	1	—	749	27	3	0

DRY MEASURE.

	Qrs.	bus.	pks.	gals.		Qrs.	bus.	pks.	gals.
21	707	4	1	0	—	498	5	2	1
22	473	1	0	1	—	289	3	2	1
23	876	2	2	0	—	649	3	3	1

	Bus.	pks.	gal.	qts.		Bus.	pks.	gal.	qts.
24	642	0	0	1	—	498	1	1	3
25	798	1	1	2	—	487	2	1	3
26	949	0	0	0	—	948	2	1	3

TIME.

	Days.	hs.	min.	sec.		Days.	hs.	min.	sec.
27	940	17	14	17	—	473	19	19	43
28	709	14	36	34	—	287	18	45	57
29	682	19	17	10	—	498	22	51	53½
30	901	11	4	0	—	247	18	40	18

	Wks.	dys.	hs.	min.		Wks.	dys.	hs.	min.
31	704	2	11	40	—	289	4	19	42
32	864	0	7	10¼	—	479	2	19	18¾

	Years.	m.	wks.	dys.		Years.	m.	wks.	dys.
33	708	4	0	2	—	473	11	0	5
34	426	7	2	5	—	269	4	3	6
35	900	0	0	0	—	473	7	2	5

COMPOUND MULTIPLICATION.

	£.	s.	d.	
1	471957326	14	7¼	×2
2	649713924	11	9¾	×3
3	47987476	17	11¼	×4
4	94641749	14	6¾	×5
5	714947693	12	9½	×6
6	493748946	19	4¼	×7
7	247473294	15	6¾	×8
8	94174946	11	9¼	×9

9	473149683	18	11½ × 56
10	642174389	14	7¼ × 84
11	749347869	14	10½ × 132
12	472693146	17	4¼ × 76
13	741869419	11	7¾ × 114½
14	874964979	19	8½ × 126¼
15	7146826147	16	11¾ × 59½
16	942674287	14	7½ × 85¼
17	479873547	18	8¾ × 49¾
18	946474186	17	11½ × 99¾
19	473647935	19	6¾ × 77½
20	1274567987	14	7½ × 64¾

TROY WEIGHT.

	Lbs.	ozs.	dwts.	grs.
21	7494	7	14	16½ × 43
22	8749	11	17	19¼ × 57½
23	4673	9	16	14 × 64¼

AVOIRDUPOIS WEIGHT.

	Tons.	cwts.	qrs	lbs.	ozs.	drs.
24	274	14	3	26	14	13¼ × 28
25	948	13	2	17	11	12 × 17¼
26	472	17	3	24	10	11½ × 59½
27	874	19	2	16	14	13 × 87¼
28	427	16	1	19	11	12 × 65
29	749	14	3	25	13	15 × 75½

LONG MEASURE.

	Deg.	miles.	fur.	pls.
30	748	53	7	35 × 126
31	824	17	4	18 × 19½
32	678	47	5	16½ × 43¼

WOOL WEIGHT.

	Tods.	stns.	clovs.	lbs.
33	709	1	1	6 × 59½
34	847	0	1	4½ × 126¼
35	942	1	0	3¾ × 74½

PAPER.

	Bundles.	rs.	qrs.	sheets.
36	746	1	17	18 × 67½
37	499	1	19	23 × 85¼
38	718	0	15	17 × 115¾

COMPOUND DIVISION.

	£	s	d.
1	7469547	17	8½÷2
2	64987489	11	4¾÷3
3	417294786	15	11½÷4
4	1749184641	16	9¼÷5
5	6473821473	14	11½÷6
6	471894173l4	17	6½÷7
7	8142740173	16	4¼÷8
8	14731473146	14	11½÷9
9	4734684731	15	4¼÷18
10	74694734129	18	11½÷27
11	74947386	14	7½÷36
12	471840949	19	8¼÷56
13	701174926	14	5½÷63
14	472864198	12	11¼÷45
15	267418949	17	8½÷189
16	4171894703	15	7¼÷437
17	14927148619	12	10¾÷7486
18	74918614732	14	6¼÷7854
19	1245786419	11	4½÷2946
20	4173127426	18	8¾÷9426

APOTHECARIES' WEIGHT.

	Lbs.	ozs.	drs.	scr.	grs.
21	7489	4	4	1	17÷56
22	14937	7	2	1	19÷67
23	42369	6	5	2	14÷126
24	987326	4	3	1	15÷749
25	47329	5	0	2	16÷98

LONG MEASURE.

	Yards.	feet.	in.	b.cns.
26	14248	1	4	2÷48
27	24956	2	7	1÷54
28	417386	1	9	1÷347
29	614217	2	11	2÷4239

ALE AND BEER.

	Barrels.	gals.	qts.	pts.
30	74986	35	3	1÷49
31	473142	14	2	1÷54
32	1871469	17	1	1÷275
33	4217946	26	2	1÷749

TIME.

	Yrs.	mths.	wks.	dys.	hrs.
34	9487	12	3	5	16÷66
35	7429	11	2	4	18÷72

	Mths.	wks.	dys	hrs.	min.	sec.
36	1749	3	5	14	57	49÷54
37	4273	1	6	10	43	47÷256
38	91471	2	4	17	35	18÷7854

REDUCTION.

1 Reduce £74. 14s. 6¼d. into farthings.
2 Reduce £476. 17s. 9½d. into halfpence.
3 Reduce 425 guineas 19s. 8½d. into farthings.
4 Change £96. 14s. 8½d. into halfpence.
5 Change £842. 19s. 6¾d. into farthings.
6 Reduce £998. 14s. 7¾d. into farthings.
7 Change 49876 halfpence into pounds.
8 Change 9497 pence into crowns.
9 Change 42736 farthings into pounds.
10 Change 731426 farthings into half-sovereigns.
11 Change £869. 14s. 2d. into twopences.
12 Change 47398 fourpences into shillings.
13 Change £298. 17s. 9d. into threepences.
14 Change £46. 10s. 8d. into fourpences.
15 Change 736988 threepences into fourpences.
16 Change 42765 fourpences into threepences.
17 Change 684816 threepences into fourpences.
18 Change 747156 fourpences into threepences.
19 Change £798. 16s. 7½d. into farthings.
20 Change 1079 guineas 12s. 9d. into threepences.
21 Change 74986 farthings into pounds.
22 Change 29476 shillings into crowns, then into half-crowns, then into pounds, and then into farthings.
23 Change £473. 14s. 4½d. into halfpence.
24 Change 94972 farthings into guineas.
25 Change 79862 halfpence into pounds.
26 Change 9498 sixpences into fourpences.
27 Change 79864 sixpences into threepences.
28 Change 17 lbs. 4 ozs. 14 dwts. 7 grs. into grains.
29 Change 184 ozs. 17 dwts. 14 grs. into half-grains.
30 Reduce 174986 grains into pounds troy.

31 Change 17 tons 13 cwts. 1 qr. 14 lbs. 3 ozs. 4 drams into drams.
32 Change 7 lbs. 4 ozs. 2 drs. 1 scr. 17 grs. into half-grains.
33 Change 7194769 drams into tons.
34 Change 27468 scruples into pounds.
35 Change 849 yds. 2 qrs. 1 nl. into nails.
36 Change 6749 E. ells into yards.
37 In 4274 yards how many E. ells?
38 In 374 miles 2 fur. 17½ poles how many poles?
39 Change 374 E. ells 3 qrs. 2 nails into inches.
40 Change 817609 b. corns into miles.
41 In 7497869 b. corns how many leagues?
42 In 814767 drams how many stones?
43 In 794 acres 2 roods 17½ perches how many square perches?
44 Change 149 acres 1 rood 19 perches into square yards.
45 Change 867 acres 3 roods 14 perches 27 square yards into square inches.
46 Change 374986 perches into acres.
47 Change 726947 grains (apothecaries' weight) into lbs.
48 Change 817426 lbs. into tons.
49 Reduce 17 lasts 5 sacks 1 wey 3 tods 1 stone 1 clove 4 pounds into pounds.
50 Reduce 819 sacks 0 wey 1 tod into half-stones.
51 Change 617 cwts. 0 qr. 14 lbs. into half-pounds.
52 Change 7198674 lbs. of wool into weys.
53 Change 417 years 4 months 3 weeks into weeks.
54 In 194 months 2 weeks 4 days how many hours?
55 In 74986 minutes how many weeks?
56 Change 674986901 seconds into years.
57 Change 17 hhds. 14 gals. 2 pts. of wine into pints.
58 Change 194 hhds. 18 gals. 1 qt. 1 pt. of ale into pints.
59 In 173 cwts. 1 qr. 1¼ lb. how many ounces?
60 In 70946 drams how many cwts.
61 In 79869 pints how many hhds. of wine?
62 In 38 cwt. 0 qr. 17 lbs. 14 ozs. how many drams?
63 Change £749. 17s. 4½d. into halfpence.
64 Change 47098 farthings into guineas.
65 Change 79 Fl. ells 1 qr. 1 nl. into nails.
66 Change 94 E. ells 2 qrs. 2 nls. into nails.
67 Change 498 Fr. ells 5 qrs. 3 nls. into inches.
68 In 794 guineas how many threepences?
69 In 4862 half-guineas how many fourpences?

70 Reckoning 365 days 5 hours 48 min. 57 secs. to the solar year, how many seconds of time were there from the birth of the Saviour to Christmas, 1856?
71 How many hours, from February 1st, 1856, to Nov. 1st, in the same year?
72 Change 4969 inches into yards of cloth.
73 Change 9479 pints into hhds. of wine.
74 Change 2674 inches into E. ells.
75 Change 31094 inches into Fl. ells.
76 Change 7494869 seconds into years.
77 In 3 tons 14 cwts. 0 qr. 17 lbs. 14 ozs. how many ozs?
78 In 174169 sheets of paper how many bundles?
79 Bring 12345 inches into French ells.
80 Bring 19846 halfpence into pounds.
81 Bring 7954 farthings into guineas.
82 Bring 7498 guineas into sixpences.
83 Bring 749 weeks into seconds.
84 Bring 9 tons 9 cwts 1 qr. 11 lbs. 11 ozs. 12 drs. into drams.

EXERCISES TO THE END OF REDUCTION.

A 1.

1 Find the difference between seven millions, five thousand, and seven; and fourteen thousand and twenty-nine; multiply the difference by seven thousand and nine; and divide the product by one hundred and ninety-eight.
2 Suppose a manufacturer has 25 guineas on hand on Monday morning, and he pays £7. 16s. 5d. on Monday; he receives £79. 15s. 6d., and he pays £29. 19s. 11d., on Tuesday; he pays £19. 19s. 10d. on Wednesday; on Thursday he pays £5. 10s.; on Friday he receives £37. 10s. 6d.; on Saturday he pays 20 guineas. What money will he have by him on Saturday night?
3 Change one million, one thousand, and one inches into miles; and prove it.
4 The sum of two numbers is 38976, and one of them is 3479: what is the other?
5 From five times 7lbs. 6oz. 3drs. 2scrs. 17grs., take seven times 4lbs. 5oz. 5drs. 1scr. 19½grs.; and reduce the difference into grains.

6 What number, subtracted from 35890101, will leave 67482?

7 A farmer has three fields; one contains 17a. 2r. 17½p.; the second, 19a. 2r. 14¼p.; and the third, 27a. 1r. 14¾p. How many perches are there in all?

8 Change seven hundred and three guineas, and sixpence, into threepences.

9 Change one million and three, fourpences, into threepences; then into sixpences; then into halfpence, shillings, and guineas.

10 A grocer bought 7 casks of raisins, each weighing 3 cwt. 1 qr. 17½ lbs.; he sold 895 lbs. and 289 half-pounds. How many pounds were left?

A 2.

1 To six times, thirty-four thousand and forty-nine, add five and a half times, seven thousand and fourteen; from the sum subtract nine times, three thousand, three hundred, and three; and divide the difference by one hundred and eighty-nine.

2 How much does 384501 amount to, when repeated 999 times?

3 Find the difference between (£134. 17s. 2½d., + £749. 19s. 2¼d.,) and (£179. 14s. 5½d.,—£86. 17s. 6¾d.)

4 Change 14298 ℔s. 7 ozs. 13½ dwts. into grains; and prove it.

5 From four times £725. 16s. 2¾d, take seven times £59. 19s. 11¼d.; then multiply the difference by 73¼.

6 From the sum of 14095 and 8376, take the difference between 427 and 999.

7 From the sum of 98763, 3275, and 944, take the difference between 10000 and 1001.

8 Add 17 yrs. 9 mths. 3 wks. 4½ days, to 12 yrs. 11 mths. 2 wks. 2¼ days; and multiply the sum by 29½.

9 Change seven million, one thousand, and six seconds, into years; and prove it.

10 A gentleman has one field, containing 23a. 3r. 1½p.; another, 14a. 2r. 17¼p.; and another, 27a. 3r. 27¾p. How many gardens could be made from the whole, each containing 3r. 13½p.?

A 3.

1 From one million, take ninety-nine thousand and nine; to the remainder add seven thousand and fifteen; and divide the sum by thirty-seven.

2 Change 74977 halfpence into pounds; and prove it.

3 The sum of two numbers is 45873, and the greater of them is 31267. What is the difference between the less and the greater?

4 From 19 ℔s. 3 ozs. 17 dwts. 19 grs., take 11 ℔s. 4 ozs. 17 dwts. 19½ grs.; multiply the remainder by 17¾; and bring the product into grains.

5 Change 1407 ℔s. 13 ozs. 4drs. into drams; and back again into pounds.

6 The divisor is 35, the quotient 38975, and the remainder 17. What is the dividend?

7 Out of a cask of sugar, weighing 13 cwts. 1 qr. 1½ ℔., a grocer sold 3 cwts. 2 qrs. 17¾ ℔s. How many half-pounds were there left?

8 Find the difference, in inches, between 3 miles, 135 yards; and 2 miles, 198½ yards.

9 From November 13th, 1855, to April 19th, 1857, how many days?

10 If the circumference of a railway carriage wheel be 8 ft. 5 in., how many times will it turn in going from Sheffield to London, 164½ miles; and how long will it be in going, supposing it to turn 2⅓ times per second, without stopping.

A 4.

1 A. has £79. 17s. 6¼d.; and B. has 17498 halfpence. If A. receive from B. 4689 halfpence, and B. receive from A. £10. 17s. 4½d.; how much will A. have more than B.

2 Suppose 5090 persons to pass over a bridge every day, and each to pay one halfpenny toll, how much would that amount to in a year, leaving out the ordinary number of Sundays.

3 A bucket is let down into a well eight times a day on week days, and only twice on Sundays; and it draws up 7½ gallons of water each time, each gallon weighing 10 ℔s. What weight of water will be drawn up in 52 weeks?

4 A bag of silver contains 19 crowns, 137 half-crowns, 243 shillings, 491 sixpences, 75 fourpences, and 269 threepences. What is the value of the whole?

5 Find how often 2cwt. 3qrs. 17lbs. 6ozs. is contained in 3 tons 3 cwts. 3 qrs. 3 lbs. 3 ozs.; and prove it.

6 Change one million and seven thousand halfpence, into guineas; and back again into halfpence.

7 From February 17th, 1856, to October 17th in the same year, how many days, hours, and minutes?

8 From July 19th, 1857, to September 26th in the following year, how many days, minutes, and seconds?

9 A silversmith bought five ingots of silver, each 17 lbs. 3 ozs. 17 dwts. 14½ grs.; and four ingots, each 14 lbs. 9 ozs. 15 dwts. 17 grs. How many spoons, each weighing 1¼ oz., could he make from the whole?

10 The dividend is 70749684, the quotient 4698, and the remainder 2502. What is the divisor?

A 5.

1 A traveller is sent to collect accounts and to pay bills. Suppose him to receive from one person £7. 16s. 5d., from another £29. 10s. 6d., from another £85. 14s. 6d., and from another £74. 14s. 2½d.; and to pay three bills, of £14. 14s. 11d., £19. 10s. 6½d., and £24. 17s. 9d. respectively. How much ought he to return to his employer?

2 Change 74876 threepences into fourpences.

3 Change 42693 fourpences into threepences.

4 Change 94868 sixpences into fourpences.

5 In a factory there are employed 5 foremen, at 6s. 6d. each per day; 163 workmen, at 3s. 9d. each per day; 75 boys, at 1s. 11½d. each, and 27 girls, at 1s. 4½d. each per day. How much will be required for wages every week, and how much per year, supposing them to work on an average 6 days per week, and 52 weeks per year?

6 Add seven times, three thousand and seven, to seventeen times, seven thousand and four; and divide this sum by the difference between seventy-nine, and forty-two.

7 From the sum of 3276 and 189, take the sum of 375 and 456.

8 From £79. 13s. 4d., take £17. 13s. 4¼d.; to the remainder add £19. 19s. 11¾d.; multiply the sum by 19¾; and divide the product by 17.

9 Change seven millions, four hundred and ninety thousand, one hundred and ninety-eight grains, into pounds troy; and prove it.

10 The product of two numbers is 387729. One of them is 643; what is the other?

A 6.

1 What is the value of a bag of money which contains the following coins:—79 guineas, 24 half guineas, 43 sovereigns, 37 half sovereigns, 47 crown pieces, 64 half crowns, and 179 shillings?

2 From the product of 74 and 406, subtract the difference between 643 and 479.

3 Change ten million, three thousand, and twenty-seven ounces, into cwts.; and prove it.

4 From 117 miles 1149 yds. 2 ft., take 4 miles 1653 yds. 1 ft. 7 ins.; and divide the difference by 19.

5 A draper bought 142 yds. of cloth, at 4s. 6d. per yard, and sold it at 4s. 11½d. per yard. What did he gain by the sale?

6 The divisor is 749, the quotient 10035, and the remainder 17. What is the dividend?

7 Supposing 5798 persons and 1746 carriages to pass over a bridge daily, the former paying a toll of a halfpenny, and the latter of twopence each; how much money would this amount to, in the course of a year of 365 days?

8 The battle of the Granicus was fought by Alexander, May 22nd, 334 B.C. How many years and days intervened between that engagement, and the battle of Agincourt, October 25th, 1415?

9 Change 7498 guineas into sovereigns.

10 Change 9478 sovereigns into guineas.

A 7.

1 To seventeen thousand and one, add three millions, seventy thousand, and nine; and divide the sum by five times one hundred and one.

2 The sum of two numbers is 7539, and the less is 493. Find the difference between the less and the greater.

3 The difference between two numbers is 476; the greater of them is 9487. Find the product of the greater by the less.

4 The difference between two numbers is 253; the less of them is 756. What is the sum of the less and the greater?

5 Find the difference between 79 guineas 13s. 4½d,, and £47. 19s. 6¾d.; and reduce it into farthings.

6 Change 7047 English ells into yards.

7 Change twenty-three millions, three thousand, and seven grains, into pounds (apothecaries' weight); and prove it.

8 A gentleman has four fields, measuring respectively:—13a. 2r. 12p.; 15a. 1r. 17½p.; 11a. 2r. 26p.; and 29a. 3r. 37½p. If he sell 36a. 2r. 19p. to one person; and 14a. 1r. 11p. to another; how many perches will he have left?

9 Change 749 yds. 1 qr. into English ells.

10 A grocer bought 5 hogsheads of sugar, each weighing 2cwt. 2 qrs. 14½ lbs. Supposing him to sell 749 lbs., and 847 half-pounds, how many pounds and half-pounds will he have left?

A 8.

1 From March 19th, 720 B.C., when the first eclipse of the moon occurred of which we have any account, to September 18th, 1857, when an annular eclipse of the sun took place, how many years and days?

2 Change 74986 halfpence into sixpences; then into threepences; then into shillings: then into fourpences, florins, half-sovereigns, and pounds.

3 A tradesman bought 113 gross of scissors, for 5s. 5½d. per gross; but he was obliged to sell them at a loss of 6½d. per gross. How much did he sell them all for; and how much did he lose by the transaction?

4 From 19 lbs. 3 ozs. 17 dwts. 19 grs., take 11 lbs. 4 ozs. 17 dwts. 19½ grs.; multiply the remainder by 17¾, and bring the product into grains.

5 The dividend is 9410746, the divisor is 7498, and the quotient 1255. Find the remainder without dividing.

6. The divisor is 3264, the quotient is half as much, and the remainder is half the quotient. What was the dividend?

7 What money will be required to pay 17s. 5½d. each, to 23 men?

8 Divide £749. 14s. 5½d. equally among 19 men; and prove the truth of the result.

9 A horse is employed in turning a wheel. Suppose him to make 567 revolutions in a day, and the length of each 36 yds., how many miles would he pass over at this rate in a day; and how many in a week of six days?

10. The fore wheel of a carriage measures 8 ft. 4 in., and the hind one 11 ft. 6 in. in circumference. How many revolutions would one make more than the other, in travelling from Sheffield to Manchester, 40¼ miles?

A 9.

1 How many parcels of sugar, each 1 qr. 17 lbs., could be made from 3 hhds., each weighing 6 cwt. 1 qr. 17½ lbs.?

2 How much money will be required to relieve 57 poor persons; giving to each, one crown, one half-crown, one shilling, one sixpence, one fourpenny piece, and one threepence?

3 A workman pays £5. 7s. 6d. per year for his house. How much is that per week?

4 Supposing a penny piece to weigh an ounce, what would be the weight in pounds of a million pence; and what would be their value?

5 Suppose a penny piece to be an inch in diameter, and a million of them to be laid in a straight line, touching each other; how far would they reach?

6 In the last question, suppose every penny piece to be ¾ of an inch in diameter, how far would they reach?

7 A farmer sold at a fair, 127 sheep, at 57s. 7d. each; and bought 2 horses, at 25 guineas each, and 7 beasts, at £14. 7s. 9d. each. What money would he have left when his purchases were paid for?

8 A silversmith purchased 3 ingots of silver, each weighing 4 lbs. 5 ozs. 17 dwts. 19 grs.; and 4 ingots, each weighing 3 lbs. 7 ozs. 9 dwts. 4½ grs. How many silver tankards, each requiring 1 lb. 3 ozs. 12 dwts. of silver, would he be able to make from the whole?

9 In 74 hhds. 45 gals. 1 qt. 1 pt. of wine, how many pints?
10 In 42796 pints, how many barrels of ale?

A 10.

1 Take 117 guineas from £150. 10s.; and multiply the remainder by 17½.
2 Add 113 guineas to £437. 19s. 6d.; and divide the sum by 19.
3 What is the weight of one piece of silver, if 127 pieces weigh 79 lbs. 4 ozs.? Prove it.
4 A tradesman bought 94 dozs. of penknives, for 17s. 6½d. per doz.; and sold them for 19s. 4d. per doz. What did he gain by the whole?
5 From January 12th, to September 19th in the following year, how many days?
6 Change 749868 farthings into threepences; then into halfpence; then into fourpences; then into shillings; then into sixpences, florins, half-sovereigns, crowns, and pounds?
7 Suppose a wheel to make 4794 revolutions in passing over 10 miles 113 yds.; what is its circumference in feet?
8 Reduce seven hundred and sixty-nine millions, four hundred and three thousand, and twenty-nine cubic inches, into cubic yards.
9 A grocer bought sugar at 4¼d. per lb.; he paid ½d. per lb. for carriage, &c., and sold it to clear 1¾d. per lb. What did he sell 143lbs. for?
10 What would be the cost of making a line of railway, 127 miles long, if the expense averaged 4 guineas per yard?

PROPORTION, OR RULE OF THREE.

1 If 1 cwt. 2 qrs. cost £3. 5s., what will 4 cwt. 1 qr. 2 lbs. cost?
2 If 3 cwt, 0 qr. 17 lbs. cost £4. 2s. 5d., what will 1 cwt. 19 lbs. cost?
3 If 2 cwt. 2 qrs. 14½ lbs. cost £3. 1s., what will 1 cwt. cost?
4 If 7 cwt. 1 qr. 1 lb. cost £4. 18s. 6d., what will 1 qr. 1½ lb. cost?

5 If 2 tons 17 cwts. 2 qrs. cost 10 guineas, what will 19½lbs. cost?

6 If 14¾ lbs. cost 6s. 5¼d., what will 1 cwt. 1 qr. 15 lbs. cost?

7 If 73 E. ells 1 qr. cost £5. 7s. 2d., what will 1 yard cost?

8 What will 3 qrs. 3 nls. cost, if 17 Fl. ells. cost £2. 1s. 4d.?

9 What will 403 Fr. ells 1 qr. 1 nl. of lace cost, at 3s. 5½d. per yard?

10 What will 703 yards 2 qrs. 1 nl. of lace cost, at 4s. 5½d. per yard?

11 How much lace can I buy for £100, at 3s. 7½d. per yard?

12 How much lace can I buy for £117. 7s. 4d., if 1 Fl. ell cost 2s. 5¼d.?

13 A draper spent £200 in buying cloth, at 7s. 8½d. per yard. How many yards had he?

14 How much tea could a grocer buy for £130. 10s., at 3s. 5¼d. per lb.?

15 If 17 E. ells cost £4. 7s. 10d., how many yards can be bought for £76. 14s. 2d.?

16 If 3 Fl. ells can be bought for 14s. 7½d., how many E. ells will £27. 19s. 4d. buy?

17 If 19 yards 1 qr. cost £3. 17s. 6¼d., how many E. ells can be bought for £43. 10s.?

18 If 27 Fr. ells cost £9. 9s. 7d., what will 3 yards cost?

19 What will 19 yards 1 qr. 1 nl. cost, if 109 E. ells cost £27. 14s. 3½d.?

20 Spent £74. 1s. 7d. in buying iron, at £3. 7s. 5½d. for 2 cwt. 3 qrs. 11½ lbs. How many cwt. had I?

21 If tea cost 6s. 4d. per lb., how much could I buy for £48. 19s. 7½d.?

22 I spent £94. 4s. 8d. in buying tea, and received 3 cwt. 3 qrs. 14½ lbs. What was the price per lb.?

23 I spent £84. 10s. 5¼d. in buying tea, and received 2 cwt. 3 qrs. 26¼ lbs. What was the price per cwt.?

24 Find the price of 171 cwt. 1 qr. 11 lbs, if 7¾lbs cost 4s. 7d.

25 A farm is let at £2. 15s. 6d. per acre. What is the rent of 357a. 3r. 13½p.?

26 If a farm consisting of 249a. 1r. 11p. let for £509. 17s. 6d. What is that per acre?

27 A farmer pays 700 guineas rent for his farm, at £2. 19s. 5d. per acre. How much land has he?

28 A farm is sold for £73. 10s. 6d. per acre. What is the value of it, if there be 106a. 1r. 29p.?

29 A farm containing 113a. 2r. 14½p. is sold for £6857. 14s· What was the price per acre?

30 A gentleman invested £7498. 10s. in the purchase of land, at £56. 10s. 8d. per acre. How much land would he have for his money?

31 Bought 6 hhds. of sugar, each 4 cwt. 1 qr. 19 lbs., at 6s. 5½d. per stone. What did it cost?

32 Bought 5 hhds. of sugar, each 3 cwt. 3 qrs. 26½ lbs. at 4s. 11d. for 9½ lbs., and paid 4s. 4½d. for carriage. What did it cost?

33 Find the value of 271 cwt. 3 qrs. 17 lbs., if 1½ stone cost £2. 7s. 9d.

34 Bought 279 E. ells. 3 qrs. 3 nls., for £86. 1s. 10¼d., and paid 1 guinea for expenses. What does it cost me per yard?

35 Bought 436 yds. 1 qr. 1 nl. of lace, at 5s. 9½d, per E. ell, and lost £2. 4s. 9d. by the sale. What did I sell it for?

36 Bought 29 cwt. 3 qrs. 17 lbs. of sugar, at 4¼d. per lb., and sold at a clear profit of £5. 9s. 8d. What did I sell it for?

37 Bought 3 silver tankards, weighing together 3 lbs. 9 ozs. 11 dwts. 11 grs., at 6s. 11d. per oz., and gave a cheque for sixteen guineas in payment. What change ought I to receive?

38 Suppose I gave a cheque for £20 after buying cloth at 6s. 10d. per yard, and received £1. 17s. 6d. change; how many yards ought I receive?

39 After purchasing lace, a lady gave a cheque for 15 guineas, and received 55 E. ells 3 qrs. of lace, and 10s. 7d. change. What was the price per yard?

40 What will 27 tons 7 cwt. of steel cost at 16s. 6d. per cwt., if 17s. 8d. be paid for carriage, &c.?

41 Bought 417 yards 1 qr. 1 nl. of cloth, and sold it for £86. 4s. 9d., and by so doing, lost £3. 4s. 8½d. What did it cost me per yard?

42 Bought 374 E. ells 2 qrs. 1 nl. of cloth, and sold it for £74. 10s. 8d., and, by so doing, gained £7. 9s. 6d. What did it cost per yard?

43 Bought 94a. 2r. 17p. of land, at £35. 10s. 9½d. per acre, and sold it again at a profit of 5 guineas per acre. What did I sell the whole for?

44 Bought 79a. 1r. 19½p. of land for £2986. 18s. 10d., and sold it again for a profit of £200. What did I sell it for per acre?

45 A silver tankard cost £7. 14s. 10½d., at 7s. 9½d. per oz. What was its weight?

46 Bought 12 tons 2 cwt. 1 qr. 14½ lbs. of steel, at £15. 10s. per ton; paid carriage, &c., 19s. 5d. How must I sell it per cwt., to clear £10 by the purchase?

47 A grocer bought 17 cwt. 3 qrs. 10 lbs. of sugar, for £32. 10s. 7d.; and retails it at 7½d. per lb. What does he gain by the transaction?

48 A grocer bought 19 cwt. 1 qr. 26 lbs. of sugar, for £35. 14s. 9d.; he paid £1. 5s. 8d. for expenses. How must he sell it per lb., to clear £7. 7s. 10d. by the bargain?

49 A piece of gold, at £3. 19s. 6d. per oz., is worth £170. 6s. 9d. What will be the worth of a piece of silver of the same weight, at 55s. 7½d. per lb.?

50 A factor bought 59 pieces of cloth, of equal length, for £1883. 18s. 10½d., at 5s. 5½d. per yard. How many yards were there in each piece?

PRACTICE.

	Articles.		d.		Articles.		d.
1	74381	at	¼	22	6419	at	4½
2	4797	at	½	23	14217	at	4¾
3	2749	at	¼	24	7489	at	5
4	18674	at	½	25	14116	at	5¼
5	47219	at	¾	26	6273	at	5½
6	24187	at	¼	27	14287	at	5¾
7	18946	at	¾	28	6478	at	6
8	7479	at	1	29	4789	at	6¼
9	12476	at	1¼	30	2437	at	6½
10	4786	at	1½	31	7148	at	6¾
11	7417	at	1¾	32	14736	at	7
12	2149	at	2	33	7498	at	7¼
13	4287	at	2¼	34	4617	at	7½
14	17418	at	2½	35	21437	at	7¾
15	9426	at	2¾	36	4198	at	8
16	4187	at	3	37	94317	at	8¼
17	14914	at	3¼	38	4719	at	8½
18	2468	at	3½	39	7498	at	8¾
19	7498	at	3¾	40	2187	at	9
20	42167	at	4	41	4279	at	9¼
21	74186	at	4¼	42	7418	at	9½

	Articles.		s.	d.
43	6417	at	0	9¾
44	9186	at	0	10
45	7429	at	0	10¼
46	4713	at	0	10½
47	6198	at	0	10¾
48	7149	at	0	11
49	4779	at	0	11¼
50	7143	at	0	11½
51	9437	at	0	11¾
52	4798	at	1	0
53	7417	at	1	0¼
54	4974	at	1	0½
55	7418	at	1	0¾
56	4129	at	1	1
57	7418	at	1	1¼
58	9479	at	1	1½
59	7419	at	1	1¾
60	4187	at	1	2
61	7486	at	1	2¼
62	9417	at	1	2½
63	4789	at	1	2¾
64	9116	at	1	3
65	7654	at	1	3¼
66	6328	at	1	3½
67	5497	at	1	3¾
68	4729	at	1	4
69	8486	at	1	4¼
70	7259	at	1	4½
71	6437	at	1	4¾
72	9243	at	1	5
73	4317	at	1	5¼
74	6489	at	1	5½
75	9432	at	1	5¾
76	7249	at	1	6
77	4932	at	1	6¼
78	7148	at	1	6½
79	4837	at	1	6¾
80	7149	at	1	7
81	4286	at	1	7¼
82	2714	at	1	7½
83	4186	at	1	7¾
84	6759	at	1	8
85	7143	at	1	8¼
86	4927	at	1	8½
87	6295	at	1	8¾
88	9273	at	1	9
89	8235	at	1	9¼
90	4716	at	1	9½
91	7354	at	1	9¾
92	5243	at	1	10
93	6789	at	1	10¼
94	2174	at	1	10½
95	4358	at	1	10¾
96	7286	at	1	11
97	1379	at	1	11¼
98	2436	at	1	11½
99	4237	at	1	11¾
100	3246	at	2	0
101	4789	at	3	0
102	7493	at	4	0
103	6837	at	5	0
104	5249	at	6	0
105	7483	at	7	0
106	2591	at	8	0
107	4132	at	9	0
108	7418	at	10	0
109	4786	at	6	8
110	9418	at	3	4
111	7592	at	2	6
112	4718	at	1	8
113	6493	at	2	4½
114	7584	at	3	5¾
115	4926	at	4	7¼
116	8214	at	5	9½
117	7148	at	6	2¾
118	4789	at	7	11½
119	4738	at	8	7¼
120	1629	at	9	9½
121	6437	at	10	11¾
122	7948	at	11	4
123	4286	at	13	8
124	6749	at	14	5¼
125	8621	at	15	3½
126	7498	at	16	2¾

	Articles.		£.	s.	d.
127	4987	at		17	11½
128	5246	at		18	8¾
129	9873	at		19	5½
130	7436	at	1	1	7
131	5389	at	1	3	8
132	6427	at	1	4	5
133	7438	at	2	3	7¼
134	9286	at	3	4	8½
135	5347	at	7	9	10
136	6832	at	12	14	6½
137	8468	at	11	16	9
138	4739	at	16	7	5¼
139	2649	at			3½
140	4217	at		4	7
141	2984	at			1¾
142	4217	at		8	6½
143	7943	at			5¾
144	6289	at		17	4½
145	8432	at			11½
146	2989	at	3	5	7¼
147	5437	at		14	6½
148	9214	at	4	5	11
149	6748	at		7	4½
150	4139	at			8¾
151	7927	at			¾
152	4286	at			¼
153	7917	at			½
154	4198	at	7	6	8
155	9879	at		17	5¼
156	2418	at		15	11¾
157	6283	at	4	17	10¼

Find the Value of the following Quantities:—

158 17 cwt. 3 qrs. 17 lbs., at £2. 13s. 7d. per cwt.
159 49 cwt. 1 qr. 19 lbs., at £1. 11s. 6½d. per cwt.
160 137 cwt. 2 qrs. 26½ lbs., at £2. 17s. 9¼d. per cwt.
161 17 cwt. 1 qr. 15 lbs., at £3. 16s. 8½d. per ton.
162 29 lbs. 7 ozs. 17 dwts., at £1. 14s. 10½d. per lb.
163 117 lbs. 10 ozs. 14 dwts., at £2. 4s. 11½d. per lb.
164 65 ozs. 15 dwts. 20 grs., at 18s. 6½d. per oz.
165 49 ozs. 11 dwts. 17 grs., at £1. 7s. 3d. per oz.
166 11 ozs. 14 dwts. 19 grs., at £2. 17s. 11d. per lb.
167 74 ozs. 4 drs. 1 scr. 14 grs., at 18s. 11½d. per oz.
168 98 ozs. 7 drs. 2 scr. 19 grs., at £1. 4s. 7d. per lb.
169 126 ozs. 5 drs. 1 scr. 13 grs., at £1. 16s. 4½d. per oz.
170 43 ozs. 6 drs. 1 scr. 15 grs., at 19s. 10½d. per oz.
171 79 hhds. 43 gals. 2 qts. 1 pt., at £17. 10s. 6½d. per hhd. (wine.)
172 86 hhds. 35 gals. 3 qts. 1 pt., at £26. 14s. 11d. per hhd.
173 149 hhds. 60 gals. 1 qt. 1 pt., at £19. 19s. 11½d. per hhd.
174 117a. 2r. 17p., at £29. 14s. 6d. per acre.
175 92a. 3r. 25p., at £36. 17s. 10d. per acre.
176 124a. 3r. 35p., at £42. 10s. 6d. per acre.
177 18a. 1r. 19p., at £74. 16s. 4d. per acre.
178 43a. 3r. 37½p., at £32. 17s. 9d. per acre.
179 111a. 1r. 14p., at £46. 10s. 11d. per acre.
180 149a. 3r. 34p., at £17. 15s. 6d. per acre.

EXERCISES TO THE END OF PRACTICE.

B 1.

1 From 1 ton 1 cwt. 1 qr. 1 lb. 1 oz., take 2 cwts. 3 qrs. 4 lbs. 5 oz. 6½ drams, and find the value of the remainder, at ¾d. per dram.

2 A person possesses £745. 16s. 6d. per year; how much may he spend daily, that he may be able to save 40 guineas every year, after paying an income tax of 5 per cent.?

3 Change 74 days 17 hours 43 minutes 47 seconds, into seconds, and prove it.

4 A grocer bought 5½ chests of tea, each weighing 2 cwt. 2 qrs. 12½ lbs., how many parcels, each containing 3¾ lbs., would he be able to make out of it?

5 Find the value of the tea in the last question, at 4s. 7¾d. per lb.

6 A merchant employs 243 men, who receive on an average £1. 6s. 6d. each per week; 44 boys, who receive 17s. 6½d. each per week; 27 girls, who have 14s. 8½d. each, and 4 foremen, who receive 2 guineas each per week; how much does he pay for wages every week, and how much per year?

7 A lady spent 7½ guineas in purchasing lace, at 4s. 7½d. per yard, how many English Ells had she?

8 A grocer went to purchase sugar with a cheque for £250., his expenses were 35s.; how much could he buy with the remainder at 55s. 6½d. per cwt.?

9 From January 7th, 1856, to November 19th, in the same year, how many days, hours, minutes, and seconds?

10 Find the value of 7597 articles at ¼d., ½d., and ¾d. each, separately, and add all the answers together.

B 2.

1 Out of a cask of sugar weighing 13 cwts. 3 qrs. 17½lbs. a grocer sold 4 cwts. 3 qrs. 19 lbs., what is the value of the remainder at 6¼d. per lb.

2 A sovereign weighs 5 dwts. 3¼ grs., of which 113 grs. are pure gold, how much alloy is there in 759 sovereigns?

3 Change 74986 farthings into twopences, fourpences, threepences, shillings, half-crowns, florins, half-sovereigns, and sovereigns, in the order in which they are named.

4 A workman earns 4s. 7d. per day, regular wages, and by extra work, on an average 5s. 6d. per week besides; calculate how much he receives yearly.

5 Bought 25 Fl. Ells 2 qrs. 2 nls. of cloth for £15. 15s. 6d., and sold it for £21. 0s. 9d., what did I gain per yard?

6 In 1174186 barleycorns, how many miles?

7 Find the value of 1957 yards, at 2¾d. per yard; 1977 yards, at 1s. 4¼d. per yard; and 1429 yards, at 4s. 6½d. per yard, and add all the answers together.

8 The product of two numbers is 4789378, one of them is 743, what is the other?

9 The sum of two numbers is 79839, the greater of them is 53114; find the difference between the less and the greater.

10 A merchant bought 34 tons 15 cwts. 2 qrs. 18 lbs. of steel, at £17. 10s. 6½d. per ton; he paid £3. 17s. 6d. for carriage, and other expenses £1. 10s.; what did the steel cost him?

B 3.

1 A grocer bought 146 cwt. 3 qrs. 17 lbs. of sugar for £297. 10s. 8d.; how must he sell it per cwt. to clear £17. 15s. 6d. by the whole?

2 Change 11071 guineas into half-guineas, then into half-sovereigns, then into florins, half-crowns, crowns, pence, and farthings.

3 The fore wheel of a carriage is 9¼ ft., and the hind wheel 12½ ft. in circumference; how many times will the whole four wheels revolve in travelling 126½ miles?

4 A Factor bought 75 pieces of linen for £2574. 19s. 4½d. at 4s. 7½d. per yard, the pieces were of equal length; how many yards were there in each piece?

5 Find the value of 957 yards at 2¾d. per yard; 1977¼ yards at 1s. 11¼d. per yard; and 3799½ yards at 3s. 5¼d per yard, and show what change should be given out of a cheque for £965.

6 In 74986 pints how many barrels of ale?

7 Bought 346 E. Ells 3 qrs. 2 nls. of cloth, and sold it for £69. 10s. 7d., and by so doing I gained £5. 10s. 6d., what did I give per yard for it?

8 Bought 429 yards 2 qrs. 3 nls. of cloth, and sold it for £87. 15s 9d., and by so doing I lost £7. 14s. 10d., what did the cloth cost me per English Ell.

9 It is supposed that London was built 1108 years B. C.; how many seconds from that time to the end of the year 1857.

10 The difference of two numbers is 649; the less of them is 7429; find the product of the greater by the less.

B 4.

1 If I can buy 15¾ yards of cloth for 10 guineas, how much can I buy for £1799. 10s. 4d.?

2 Change £407. 19s. 6½d. into half-crowns, sixpences, half-pence, fourpences, pence, shillings, and pounds, in the order in which they are named.

3 How many packets of raisins, each 7¼lbs., can be bought for £100. at 5¼d. per lb.

4 Find the value of the following articles:—779¼ yards, at 2¾d. per yard; 642 lbs., at 2s. 5¼d. per lb.; and 436 ounces, at 1s. 2¼d. per oz.

5 From July 3rd, 1827, to December 19th, 1857, how many years and days?

6 Find the value of 2007 bags of fruit at 13s. 7½d. per bag.

7 Find the value of 114 tons 18 cwts. 3 qrs. 17 lbs. 14 ozs., at £10. 18s. 7d. per ton.

8 Suppose a draper gave a cheque for £230, after buying cloth at 9s. 8½d. per yard, and received £2. 15s. 7d. change, how much cloth ought he to receive?

9 The divisor is 9074, the quotient 4716, and the remainder 69, what is the dividend?

10 A merchant bought 27 chests of tea, which weighed on an average 1 cwt. 3 qrs. 13½ lbs. each; he sold 17 chests at 4s. 2½d. per lb., and the remainder at 4s. 8½d. per lb., and cleared 20 guineas by the transaction; what did he give for the tea?

B 5.

1 What quantity of tea at 4s. 5¾d. per lb. will be of the same value with 5 cwt. 3 qrs. of sugar, at 7s. 10½d. per stone?

2 How much coffee can be bought for £150., at 1s. 7½d. per lb.?

3 A spirit merchant spent £269. 10s. 6d. in buying rum, and received 350 gallons, 3 quarts, 1 pint; for how much was the rum sold per gallon?

4 In 71489 farthings how many guineas?

5 Find the value of 27 cwts. 1 qr. 19 lbs. 12 ozs. 12 drs., at £4. 17s. 8½d. per cwt.

6 A farmer sold 17a. 2r. 13½p. from a field containing 28a. 2r. 7p.; how many square yards had he left?

7 A spirit merchant bought 113 gallons 3 quarts 1 pint of brandy, and sold it at 36s. 9½d. per gallon, and by so doing gained £10. 5s.; what did he give for the whole?

8 A corn merchant bought 127 qrs. 5 bus. 3 pecks of barley, and sold it at 37s. 5½d. per quarter, and by so doing lost £8. 4s. 5d.; what did he give for the whole, and how much per quarter?

9 Change 14798 grains into pounds (apothecaries' weight,) and prove it.

10 A merchant bought 12 tons 8 cwts. 3 qrs. of goods for £720., and paid 56s. expenses; how must he sell them per cwt. to clear £61. 5s. by the outlay?

B 6.

1 A grocer sold 13 chests of tea, weighing 3 qrs. 17½ lbs. each, at 20 guineas per cwt.; find the value of the tea, supposing each chest when empty to weigh 17¾ lbs.

2 Change 17419 halfpence into half-guineas.

3 Calculate a servant's wages for 3 years 7 months 17 days, at £11. 5s. per year.

4 How many stones of flour would a flour dealer be able to sell from 27 bags, each containing 18⅓ stones, and what would be their value at 2s. 10½d. per stone?

5 Change 7 tons 7 cwts. 0 qrs. 0 lbs. 11 ozs. into ounces, and prove it.

6 Change 14 centuries 85 years 266 days, into days, hours, and minutes.

7 A grocer bought a hhd. of sugar, weighing half a ton, for £30., which he retailed at 7½d. per lb.: how much did he gain by it?

8 Divide 7489a. 1r. 10p. equally among 59 men, and prove it.

9 A draper bought 729 yards 1 quarter 1 nail of cloth for £273. 10s. 2½d.; how must he sell it per English ell to clear £17. 6s. 3d. by the sale?

10 Bought 126 tons 13 cwt. of steel for £2068. 10s. 6½d., paid carriage, &c., £2. 10s. 6d.; how may I sell it in portions of 2 qrs. 17½ lbs. each, to clear £35. 10s. 6d. by the transaction?

B 7.

1 The dividend is one million, three thousand, and seven; the divisor is seven hundred and fifty-six; the quotient is one thousand, three hundred, and twenty-six; show what the remainder will be without dividing.

2 The dividend is 740089, the quotient is 759, and the remainder is 64; what is the divisor?

3 A, B, C, and D represent four towns in a straight line; from A to B is 4 miles 3 fur. 10 p.; from B to C is 3 miles 3 fur. 17½ p.; and from A to D is 19 miles 1 fur. 19½ p.; how far is it from C to D?

4 Change 74906 farthings into half-guineas.

5 Change 400918 halfpence into half-sovereigns.

6 If a grocer sell 4 chests of tea, each weighing 1 cwt. 1 qr. 19½ lbs., at 4s. 5¼d. per lb.; what will it produce?

7 If a grocer sell 3 chests of tea, one weighing 2 cwt. 1 qr. 1½ lb., another 1 cwt. 3 qrs. 13½ lb., and the third 2 cwt. 2 qrs. 26½ lbs., at 23 guineas per cwt., and gain £5. 17s. 6d. by the sale, what did he give for it?

8 Change 7497 half-guineas into sixpences, then into florins, then into half-crowns and pounds.

9 Find the value of 1274 articles at ¾d. each, at 2¾d. each, and at 1s. 4¾d. each.

10. If 3407 yards of lace be of the same value as 749 dozs. of razors at 2½ guineas per doz., what is the value of the lace per yard?

B 8.

1 Find the sum, the difference, product, and quotient of 903 and 21.

2 Find the sum, difference, product, and quotient of 744 and 24; then multiply the product by the quotient.

3 In 74113 guineas how many threepences?

4 From 1 ton 1 cwt. 1 lb. take 473½ lbs., and find the value of the remainder at 2s. 5½d. per lb.

5 To 7496 lbs. add 2 tons, 2 qrs. 2½ lbs., and find the value of the sum at £17. 12s. 6d. per ton.

6 Suppose a railway carriage wheel to be 14 ft. 4¼ in. in circumference, and that it turns round 11359 times in passing from one town to another; how far are these towns apart?

7 How many times will a carriage wheel turn in going from Sheffield to Leeds, 39¾ miles, if it be 13 ft. 6 in. in circumference?

8 What is the circumference of a carriage wheel which turns 7495 times in passing over 20¼ miles?

9 Change 740009 ounces into tons, and prove it.

10 A draper spent £246. about the purchase of some cloth, of which £1. 10s. was for carriage, and 3 guineas for other expenses; suppose he had 759 yards 3 qrs. 1 nl., what did he give per yard for the cloth, and how must he sell it per yard to clear £15. 10s. by the transaction?

B 9.

1 The sum of two numbers is 9547, the less of them is 2499; find the product of the sum of the two numbers, by their difference.

2 The sum of two numbers is 4735, the greater of them is 3169; find the product of the two numbers, and to it add the difference of the same.

3 The difference of two numbers is 172, the greater of them is 947; find the product of the greater by the less.

4 Change 749916 florins into crowns, then into half-crowns, then into sixpences, shillings, and pounds.

5 Change 174992 barley corns into miles.

6 Change 12 tons 1 qr. 14 oz. into drams, and prove it.

7 Find the value of 1743 ozs. at ¼d. per oz., at ¾d. per oz., and at 5¾d. per oz., and add all the answers together.

8 Find the value of 297 yards of cloth at 4s. 6½d. per yd., at 7s. 11¼d. per yd., and at 14s. 10½d. per yd., and show what change ought to be given out of a cheque for £497. 10s. in payment for the whole.

9 From a quantity of steel weighing 167 tons 14 cwts. 1 qr., a merchant sold 17 tons 15 cwt. 3 qrs. to one tradesman, and 34 tons 3 cwts. 1 qr. to another; find the value of the remainder at £18. 17s. 6d. per ton.

10 A grocer bought 7 chests of tea, weighing on the average 2 qrs. 17½ lbs. each, for £23. 7s. 6d. per cwt.; he paid £1. 6s. 7d. for carriage, and for other expenses 19s. 6d.; how must he sell the tea per lb. to clear £17. 10s. by the purchase?

B 10.

1 From January 13th, 1856, to August 17th, 1857, how many minutes and seconds?

2 From 46 gallons 1 qt., take 17 gallons 1 quart 1 pint, and find the value of the remainder at 3½d. per pint.

3 How much coffee at 1s. 8½d. per lb. will be of the same value with 1 cwt. 2 qrs. 17½ lbs. of sugar, at 38s. 5½d. per cwt.?

4 In seventy-six millions, five hundred and one thousand, and seventy-one threepences, how many guineas are there?

5 A, B, C, and D represent four towns:—From A to B is 4 miles 3 fur. 17 p.; from B to C is 6 miles, 5 fur. 29½ p., and from C to D is 7 miles 7 fur. 24¼ p.; what will the whole distance cost repairing at £24. 17s. 9d. per mile?

6 Bought 469 E. ells 3 qrs. 3 nls. of lace for £119. 6s. 5d., and sold it so as to gain £14. 6s. 8d. by the whole; how did I sell it per yard?

7 Sold 374 F. ells 5 qrs. 1 nl. of lace for £84. 14s. 7d., and by so doing lost 10 guineas by the whole; how did I buy it per E. ell?

8 To 2 tons 17 cwts. 17 lbs. add 1 ton 19 cwts. 1 qr., and find the value of the whole at 3 guineas per cwt.

9 To 1 ton 19 cwt. 1 qr., add five times 17 cwts. 1 qr. 17 lbs. 14 oz., and find the value of the whole at 2¼d. per oz.

10 A piece of gold, at £3. 17s. 6½d. per ounce, is worth £129. 14s. 6d.; what will be the worth of a piece of silver, of equal weight, at £2. 14s. 6½d. per lb.?

SIMPLE INTEREST.

1 Find the interest of £426. 10s. 6½d., for one year, at 3 per cent.

2 Find the interest of £749. 14s. 4d., for one year, at 3½ per cent.

3 Find the interest on £457. 17s. 9d., for one year, at 4¼ per cent.

4 Find the interest on £642. 14s. 8½d., for one year, at 5 per cent.

5 Find the interest on £449. 18s. 7½d., for one year, at 5¼ per cent.

6 Find the interest on £849. 17s. 9½d., for three years, at 5½ per cent.

7 Find the interest on £779. 16s. 8½d., for 4¼ years, at 4¾ per cent.

8 Find the interest on £1174. 14s. 11½d., for 7¾ years, at 5¾ per cent.

9 What is the interest on £869. 14s. 6d., for 3 years 4 months 15 days, at 2¼ per cent?

10 What is the interest on £537. 5s. 6d., for 4 years 7 months 3 weeks, at 3¾ per cent.?

11 Find the amount of £647. 14s. 8d., for 5 years 5 months 19 days, at 4½ per cent.

12 Find the amount of £848. 18s. 8d., for 11 years 8 months 24 days, at 5½ per cent.

13 Find the interest on £479. 9s. 6d., for 7 years 17 weeks, at 5¼ per cent.

14 Find the amount of £746. 14s. 4¼d.. for 4 years 23 weeks, at 4½ per cent.

15 Find the amount of £477. 14s. 11d., for 9 years 19 weeks, at 3¾ per cent.

16 Find the interest on £4365. 10s. 6½d., for 7 years 7 months 13 days, at 2¼ per cent.

17 What is the interest on £468. 14s. 7½d., for 3 years 219 days, at 3⅓ per cent.

18 What is the amount of £6799. 14s. 8d., for 4 years 146 days, at 2½ per cent.?

19 Find the amount of £435. 12s. 9d., for 3 years 89 days, at 4¼ per cent.

20 Find the interest on £949. 19s. 10d., for 7 years 135 days, at 5½ per cent.

21 Find the interest on £746. 14s. 8d., for 5 years 5 months 19 days, at 1¼ per cent.

22 What is the amount of £98. 16s. 9d., for 9 years 9 months 10 days, at 3¾ per cent.?

23 Find the amount of £477. 16s. 7¼d., for 4 years 5 months 7 days, at 2¾ per cent.

24 What is the interest on £699. 18s. 9½d., for 9 years 11 months 17 days, at 4½ per cent.?

25 What is the amount of £749. 14s. 8½d., for 7 years 8 months 19 days, at 5¼ per cent.?

26 Calculate the interest arising from £427. 16s. 10½d., for 5 years 39 weeks, at 2½ per cent.

27 Find the interest on £678. 14s. 4¼d., for 7 years 43 weeks, at 3¼ per cent.

28 What is the amount arising from £798. 14s. 11d. for 5 years 119 days, at 4⅓ per cent.

29 Find the amount of £1457. 17s. 7½d., for 3 years, 227 days, at 4⅓ per cent.

30 Find the interest on £474. 14s. 6½d., for 7 years 11 months 4 days, at 4½ per cent.

31 In what time will £759. 10s. amount to £865. 16s. 7d., at 3½ per cent.?

32 In what time will £479. 15s. amount to £517. 10s. 6¾d., at 2¼ per cent.?

33 In what time will £654. 19s. 8d. amount to £787. 6s. 0½d., at 4¾ per cent.?

34 In what time will £247. 12s. 6½d. amount to £353. 3s. 5¼d., at 5½ per cent.?

35 In what time will £455. 7s. 6d. amount to £501. 8s. 4d., at 2⅓ per cent.?

36 In what time will £649. 16s. 8½d. amount to £767. 6s. 10¾d., at 3½ per cent.?

37 What sum will amount to £1719. 10s. in 2¾ years, at 3¼ per cent.?

38 What sum will amount to £476. 14s. 7½d. in 7⅓ years, at 4¼ per cent.?

39 What sum will amount to £1276. 12s. 6d. in 4¼ years, at 3½ per cent.?

40 What sum will amount to £699. 7s. 10½d. in 7½ years, at 2¾ per cent.?

41 What sum will amount to £425. 19s. 6½d. in 2½ years, at 5⅓ per cent.?

42 What sum will amount to £1766. 10s. 6d. in 4¼ years, at 3¾ per cent.?

43 At what rate per cent. will £476. 14s. 7½d. amount to £507. 2s. 0¼d. in 3 years?

44 At what rate per cent. will £246. 7s. 6d. amount to £282. 8s. 0¾d. in 4½ years?

45 At what rate per cent. will £749. 14s. 4½d. amount to £839. 1s. 2¼d. in 2¾ years?

46 At what rate per cent. will £469. 14s. 9½d. amount to £566 12s. 5¼d. in 7½ years?

47 At what rate per cent. will £2749. 17s. 6d. amount to £3581. 14s. 2¼d. in 5½ years?

COMPOUND INTEREST.

1 Find the compound interest on £274. 4s. 6d. for 2 years, at 3 per cent.

2 Find the compound interest on £427. 17s. 8½d., for 2 years, at 3½ per cent.

3 Find the compound interest on £746. 10s. 9d., for 2 years, at 4 per cent.

4 Find the compound interest on £659. 15s. 7½d., for 3 years, at 2¼ per cent.

5 Find the compound interest on £577. 19s. 8½d., for 3 years, at 4¾ per cent.

6 Find the compound interest on £674. 13s. 8½d., for 3 years, at 3⅓ per cent.

7 Find the compound interest on £479. 18s. 7½d., for 4½ years, at 3½ per cent.

8 Find the compound interest on £849. 14s. 2½d., for 4¼ years, at 2¼ per cent.

9 Find the compound interest on £747. 14s. 8½d., for 5½ years, at 5 per cent.

10 Find the compound interest on £947. 19s. 10½d,. for 5¾ years, at 5 per cent.

11 Find the compound interest on £746. 14s. 6½d., for 3½ years, at 2½ per cent.

12 Find the compound interest on £569. 16s. 8½d., for 4¼ years, at 3 per cent.

13 Find the compound interest on £657. 10s. 8½d., for 3¾ years, at 4¼ per cent.

14 Find the compound interest on £479. 19s. 7½d., for 3 years 5 months 18 days, at 2¼ per cent.

15 Find the compound interest on £767. 17s. 6½d., for 2 years 10 months 26 days, at 3⅓ per cent.

16 Find the compound interest on £755. 17s. 9d., for 2 years 8 months 10 days, at 4 per cent., the interest to be paid half-yearly.

17 Find the compound interest on £966. 10s. 10d., for 3 years 7 months 17 days, at 6 per cent., the interest to be paid half-yearly.

18 Find the compound interest on £473. 12s. 8½d., for 2¼ years, at 3½ per cent., the interest to be paid half-yearly.

19 Find the compound interest on £547. 18s. 4½d., for 3¼ years, at 4½ per cent., the interest to be paid half-yearly.

20 Find the compound interest on £877. 14s. 2½d. for 2 years 11 months 11 days, at 6½ per cent., the interest to be paid half-yearly.

21 Find the compound interest on £799. 17s. 7½d., for 1 year 1 month 1 day, at 6 per cent., the interest being paid quarterly.

22 Find the compound interest on £647. 12s. 2½d. for 2¼ years, at 5 per cent., the interest being paid quarterly.

23 Find the compound interest on 4579. 14s. 8½d., for 2 years 2 months 17 days, at 6 per cent., the interest being paid quarterly.

24 Find the compound interest on £622. 12s. 3½d., for 1 year 10 months 19 days, at 5 per cent., the interest to be paid quarterly.

25 What sum will amount to £746 10s. 6d., in 3½ years, at 3¼ per cent. compound interest?

26 What sum will amount to £942. 14s. 7½d. in 4¾ years, at 2½ per cent. compound interest?

27 What sum will amount to £678. 12s. 10½d., in 3¾ years, at 4¼ per cent. compound interest.

28 What sum will amount to 1000 guineas, in 2¾ years, at 3¾ per cent. compound interest?

29 What sum will amount to £749. 12s. 6d., in 4½ years, at 2¾ per cent. compound interest?

30 What sum will amount to £1247. 10s. 6d., in 3¾ years, at 4¼ per cent. compound interest?

COMMISSION.

1 What is the commission on £742. 10s., at 3 per cent.?

2 What is the commission on £247. 5s., at 2½ per cent.?

3 What is the commission on £942. 17s. 6d., at 2¼ p. cent.?

4 Find the commission on £427. 2s. 4½d., at 4¾ per cent.

5 Find the commission on £678. 14s. 2½d. at £1. 17s. 6d. per cent.

6 What is the commission on £573. 19s. 11½d., at £1. 5s. 7d. per cent.?

7 What is the commission on £247. 7s. 10d., at 12s. 6d. per cent.?

8 What is the commission on £97. 4s. 2¾d., at 17s. 6d. per cent.?

9 What is the commission on £48. 16s. 8d., at 5s. 7½d. per cent?

10 Find the commission on £99. 18s. 7d., at £2. 5s. 6d. per cent.

11 Find the commission on £747. 14s. 8½d., at 3s. 4d. per cent.

12 Find the commission on £942. 10s., at £3. 7s. 6d. per cent.

13 What is the commission on £271. 14s. 8d., at 2s. 6d. per cent.?

14 What is the commission on £1273. 10s. 2½d., at 7s. 4d. per cent.?

15 Find the commission on £343. 7s. 8d., at £1. 7s. 4d. per cent.

16 Find the commission on £1326. 16s. 10d., at 5s. 10d. per cent.

17 Find the commission on £437. 17s. 9d., at 3¾ per cent.

18 Find the commission on £1279. 8s. 9d., at £2. 18s. 10d. per cent.

19 What is the commission on £437. 2s. 6½d., at 11s. 9½d. per cent?

20 Find the commission on £3479. 13s. 7½d. at £1. 19s. 7d. per cent.

BROKAGE.

1 Find the brokage on £179. 10s. 6d., at 2⅓ per cent.
2 Find the brokage on £1177. 4s. 8½d., at 3⅓ per cent.
3 Find the brokage on £749. 2s. 2½d., at 7s. 6d. per cent.
4 What is the brokage on £247. 14s. 10d., at £1. 14s. 10d. per cent. ?
5 What is the brokage on £367. 12s. 9d., at £1. 7s. 9½d. per cent. ?
6 What is the brokage on £429. 17s. 8½d., at 2s. 3½d. per cent. ?
7 Find the brokage on £747. 12s. 10½d., at 6s. 2½d. per cent.
8 Find the brokage on £1244. 18s. 8½d., at 19s. 7½d. per cent,
9 Find the brokage on £476. 17s. 7½d., at £1. 15s. 7½d. per cent.
10 What is the brokage on £127. 7s. 6½d., at 5s. 6½d. per cent. ?
11 Find the brokage on £749. 17s. 10½d., at £1. 5s. 10½d. per cent.
12 Find the brokage on £1477. 10s., at 2s. 3½d. per cent.
13 What is the brokage on £294. 9s. 8d., at £1. 14s. 9½d. per cent.?
14 What is the brokage on £1747. 10s., at 7s. 8d. per cent. ?
15 Find the brokage on £869. 14s. 8½d., at 4s. 6½d. per cent.

INSURANCE.

1 Find the insurance on £200., at 5s. per cent.
2 Find the insurance on £300., at 3s. per cent.
3 Find the insurance on £400., at 2s. 6d. per cent.
4 Find the insurance on £500., at 5s. per cent.
5 What is the insurance on £274. 19s. 6d., at 3s. 4d. per cent. ?
6 What is the insurance on £476. 17s. 8d., at 6s. 8d. per cent ?
7 What is the insurance on £643. 12s. 2d., at £1. 2s. 6d. per cent. ?
8 What is the insurance on £1277. 10s., at £1. 3s. 4d. per cent. ?

9 Find the insurance on £759. 12s. 6d., at £1. 10s. per cent.
10 Find the insurance on £479. 17s. 9d., at £1. 7s. 6d. per cent.
11 Find the insurance on £1299. 14s. 11½d., at £1. 14s. 10d. per cent.
12 What sum must be paid to insure £749. 17s. 6d., at 11s. 8d. per cent.?
13 What sum must be paid to insure £1743. 17s. 8d., at 3s. 2d. per cent.?
14 What will be the insurance on £764. 12s. 7d., at 4s. 6½d. per cent.?
15 What will be the insurance on £949. 17s. 11d., at £1. 3s. 10½d. per cent.?

DISCOUNT.

1 Find the discount on £117. 10s., for 9 months, at 2½ per cent.
2 Find the discount on £1743. 15s. 6d., for 7 months, at 3¼ per cent.
3 Find the present worth of £746. 12s. 7d., due in 113 days, at 2⅓ per cent.
4 Find the present worth of £294. 10s. due in 1 year 127 days, at 3⅓ per cent.
5 Find the discount on 747 guineas, for 1 year 4 months, at 4½ per cent.
6 What is the discount on £1477. 12s. 6d., for 1 year 7 months, at 5 per cent.?
7 What is the discount on £711. 11s. 10d., for 2 years 6 months, at 2¼ per cent.?
8 Find the present worth of £1148. 16s. 8d., for 2 years 114 days, at 3½ per cent.
9 What is the present worth of £1177. 12s. 6d., due in 2 years 4 months 17 days, at 4⅓ per cent.?
10 What is the discount on £848. 12s. 7d., due in 3 years 5 months 19 days, at 3½ per cent.?
11 Find the present worth of £1124. 12s. 9d., due in 3 years 10 months 10 days, at 5⅓ per cent.
12 Find the present worth of £2474. 16s. 10d., due in 1 year 127 days, at 2¼ per cent.
13 Find the present worth of £677. 17s. 6d., due in 119 days, at 3¼ per cent.

14 What is the discount on £3755. 14s. 10d., due in 2 years 124 days, at 4⅓ per cent.?

15 What is the present worth of a legacy of 3000 guineas, due in 2 years 10 months 19 days, at 3⅓ per cent., and prove it?

EXERCISES TO THE END OF DISCOUNT.

C 1.

1 Find the simple interest on £379. 17s. 6d., for 3 years 5 months 17½ days, at 3⅓ per cent.

2 Sold for my employer 47 quarters of wheat, at £3. 1s. 7½d. per quarter; and 129 quarters of barley, at £1. 1s. 11½d. per sack. What will my commission amount to at 3s. 4d. per cent.?

3 If a gentleman's estate produce £4000 a-year, and his taxes average 3s. 7½d. in the pound, what is his net income?

4 The British possessions in Hindostan are said to contain 221,357 square miles, and the population is estimated at 147 millions; how many inhabitants are there to the square mile?

5 Bought 279 English ells 2 quarters 1¼ nails of cloth for £67. 17s. 10d., and sold it again for £73. 14s. 8½d.; what did I gain per yard?

6 What sum will amount to £1279. 15s. 6d., in 3¼ years, at 2¾ per cent.? Prove it.

7 Suppose I sell 157½ dozens of penknives, at 18s. 7½d. per dozen; and 249 pairs of razors, at 2s. 6d. per pair, and my commission is 2¼ per cent., what ought I to remit to my employer?

8 From one million, three thousand and three ounces, subtract 3 cwt. 1 qr. 17½ lbs.; and find the value of the remainder, at 7¼d. per lb.

9 Find the brokage on £1279. 10s. 8d., at 7s. 5½d. per cent.

10 Find the discount on £749. 10s., due in 2 years 119 days, at 3½ per cent., and prove the truth of the answer.

C 2.

1 A tradesman bought 27½ stones of candles, at 5¼d per lb.; 7 cwt. 1 qr. 17 lbs. of sugar, at 5¾d. per lb.; and 4½ cwt. of soap, at 3s. 4½d. per dozen pounds; what do they all amount to?

2 Find the difference between the simple and the compound interest on £358. 2s. 4d., for 3 years 3 months 11 days, at 2¾ per cent.

3 A lady purchased 49 yards 1 qr. 3 nls. of lace, and gave a cheque for £17. 10s. in payment, out of which she received 16s. 8½d. change; what was the price of the lace per yard?

4 If a pendulum vibrate sixty-five times per minute, how many vibrations will it make in a year consisting of 365 days 5 hours 48 minutes 57 seconds?

5 Find the value of 1757½ lbs., at 4½d. per lb.; 741 lbs., at 1s. 4¼d. per lb.; and 279½ lbs., at ¾d. per ounce, and add all the answers into one sum.

6 From the birth of Augustus, 23rd September, 63 B.C., to the birth of Queen Victoria, May 24th, 1819; how many years, days, hours, minutes, and seconds?

7 A legacy of 1000 guineas was left to a young gentleman, to be paid in 2 years 2 months 19 days; what sum would be exactly equivalent, if paid at the present time, allowing 3¼ per cent.? Show the truth of the answer.

8 A young gentleman has a legacy of £2500 left him, which he allows to remain in the hands of the trustees 7½ years, and then receives in full £3479. 10s.; what was the rate of interest allowed?

9 At what rate per cent. will £325. 16s. 8d. amount to £374. 6s. 0¼d. in 3½ years?

10 An agent purchased for his employer 746 sacks of flour, at £1. 19s. 6d. per sack, and 246 qrs. of wheat, at 7s. 10½d. per bushel; his commission is 1½ per cent.; what will be the amount of the invoice?

C 3.

1 Change three hundred and seven millions, three thousand and ninety-six stones into cwts., and find the value of half the quantity at 1¼d. per lb.

2 A spirit merchant purchased 2071 gallons of rum for £1746. 10s., but 14 gallons leaked out, he then added 36 gallons of water; how should he sell the mixture per gallon to clear £29. 16s. 7d. by the purchase?

3 Find the sum, the difference, the product, and the quotient of 47 and 3008.

4 A loaded truck weighs 3 tons 1 cwt. 17 lbs., the truck weighs 1 ton 17 cwts., and it is loaded with 541 equal packages; what is the weight of each?

5 What sum must be paid to insure £7497. 10s., at 2s. 3½d. per cent.?

6 A bankrupt owes a creditor £294. 17s. 6d.; he pays two dividends, one of 5s. 7½d. in the pound, and the other of 8½d. in the pound; how much would the creditor receive at each dividend, and what would be his whole loss?

7 A grocer bought a quantity of tea, at 4s. 2¼d. per lb., for which he gave a cheque for £100, and received £1. 14s. 6d. change; how much tea should he receive?

8 An agent is allowed 5 per cent. commission by his employers, and he guarantees all his debts; he sells 114 gross of razors at £15. 14s. 10d. per gross, and 573 dozens of knives at 18s. 4½d. per dozen; his bad debts amount to £17. 14s. 6d.; what sum is due to him from his employers?

9 Find the simple interest on £374. 7s. 10d. for 2 years 7 months 9 days, at 3¼ per cent.

10 The battle of Marathon was fought September 28th, 400 B.C., and the battle of Trafalgar was fought October 21st, 1805—supposing the average age of man to be 35 years 113 days—how many generations of men lived from one engagement to the other?

C 4.

1 The less of two numbers is 796; their difference is 249; what is the product of their sum multiplied by the greater?

2 Find the difference between the simple and the compound interest on £1879. 10s., for 3 years 4 months 19 days, at 4½ per cent.

3 What would a broker's charge be for the transfer of shares to the amount of £749. 12s. 8d., at 2s. 6d. per cent.?

4 Find the value of 949 lbs. at ¾d. per lb., at 3¼d., at 1s. 5¼d., and at 2s. 1¼d per lb., and add all the answers into one sum.

5 The divisor is 4973, the quotient is 749, and the dividend 3724986; show what is the remainder without dividing.

6 Sold for my employer 47 qrs. of wheat, at £3. 1s. 7½d. per quarter, and 107¼ qrs. of barley, at £1. 19s. 8d. per quarter; what must I remit to him, deducting my commission, at 4s. 2d. per cent.?

7 A draper bought a quantity of cloth, for which he paid £374. 19s. 8d.; his expenses were £2. 4s. 7d., and he paid for carriage 17s. 6d.; he had 754 yds. 3 qrs. 3 nls.; what did it cost him per English ell?

8 In what time will £1479. 10s. amount to £1695. 17s. 6d., at 3¼ per cent.? Prove it.

9 At what rate per cent. will £2746. 4s. 6d. amount to £2997. 19s. 2½d. in 2¾ years? Prove it.

10 What sum will amount to £1894. 10s. 8d., in 3½ years, at 2¾ per cent.? Prove it.

C 5.

1 What is the present worth of a legacy of £1479. 14s. 4d., to be paid in 2 years 117 days, at 4½ per cent.? Prove the truth of the answer.

2 To three times 1 ton 2 cwts. 1 qr. 19 lbs. add five times 17 cwt. 2 qrs. 17 lbs., and show how many parcels, each weighing 3 lbs. 4 ozs., could be made from the sum.

3 Change 471316 halfpence into farthings, pence, half-crowns, crowns, shillings, sixpences, florins, and pounds, in the order in which they are named.

4 A gentleman sold a farm consisting of 147 acres 3 rds. 17½ poles, for £73. 10s. 9d. per acre; the expenses of the sale, on his part, were 2 per cent. of the purchase money; what would be the simple interest of the net proceeds of the sale, for 3 years 5 months 5 days, at 3½ per cent.?

5 A person put out £479. 10s. at a certain rate per cent., and at the end of six years he received for principal and interest £619. 12s. 6d.; what was the rate per cent.?

6 A bankrupt owes £798. 10s., and his effects are worth £239. 11s.; how much will he be able to pay in the pound, and what will a creditor receive for his debt of £245. 9s. 7d.?

7 Find the difference between the compound interest on £749. 14s. 7d., for 4 years 3 months 13 days, at 5 per cent., and the compound interest on the same sum, for the same time and at the same rate per cent., the interest to be paid half-yearly.

8 A carriage wheel makes 7346 revolutions in travelling from Sheffield to Haddon Hall, a distance of 18¼ miles, what is its circumference?

9 If a carriage wheel, whose circumference is 10 ft. 7⅛ in., make twenty thousand and three revolutions in passing from one town to another, how far are those towns apart?

10 An agent bought for his employer 479½ yards of calico, at 4¼d. per yard; 179¼ yards of cloth, at 1s. 4½d. per yard; and 357¼ yards of lace, at 3s. 10⅛d. per yard; his commission is 2s. 4½d. per cent.; find the amount of the invoice.

C 6.

1 In sixty millions, sixty thousand, and sixty seconds, how many years?

2 What is the commission on £1713. 3s. 8d., at 1⅛ per cent.?

3 Find the simple interest on £377. 10s. from February 17th, 1856, to July 19th, 1857, at 3⅛ per cent.

4 A gentleman insures his life for £500 each, in two offices; one charges £2. 18s. 7d. per cent., and the other £2. 19s. 6d. per cent.; what does he pay annually for the insurance?

5 At what rate per cent. will £1141. 10s. amount to £1713. 14s. 8d. in 6½ years? Prove it.

6 In what time will £1077. 12s. 8d. amount to £1377. 19s. 6d., at 4½ per cent.? Prove it.

7 What sum will amount to £1869. 10s., in 4¾ years, at 5¼ per cent.? Prove it.

8 From 17 cwts. 1 qr. 14 lbs., take 1 cwt. 3 qrs. 14 lbs. 7 ozs., and find the value of the remainder at 2¼d. per ounce.

9 A draper bought 177 yds. 1 qr. 1 nl. of cloth for £67. 10s. 7d., and sold it at a loss of £3. 17s. 6d.; how did he sell it per English ell?

10 A bankrupt owes £1747. 10s. 6d., and he can only pay 17s. 6d. in the pound; what are his effects worth?

C 7.

1 A piece of cloth, at 7s. 9⅓d. per yard, cost £17. 14s. 11½d.; what will a similar piece cost at 14s. 2¾d. per English ell?

2 At what rate per cent. will £325. 16s. 8d. amount to £374. 6s. 0¼d. in 3½ years? Prove it.

3 A person possesses £749. 10s. a year; how much may he spend daily in order to save 37 guineas per annum, after paying an income tax of 5 per cent.?

4 In 71,476,947 cubic inches, how many cubic yards?

5 A manufacturer gave £73. 10s. 9d. for wool, and £19. 10s. 2d. for making it into cloth; he sold the cloth for 5s. 11¼d. per yard, and gained £17. 11s. 9d. by the whole; how many yards had he?

6 How many yards of velvet, at 14s. 4½d. per yard, will be of the same value, with 113 cwts. 2 qrs. 17 lbs. of soap, at 47s. 5d. per cwt.?

7 Find the simple interest on £1426. 19s. 7d. from January 3rd, 1848, to December 3rd, in the following year, at 2¾ per cent.?

8 An agent bought 29 boxes of oranges, at 5 guineas per box; 79 boxes of lemons, at £4. 17s. 8d. per box; and 17 cwts. 2 qrs. 27 lbs. of currants, at 5⅓d. per lb.; he paid 17s. 8d. for expenses, and his commission is 7s. 4½d. per cent.; make out the invoice.

9 Find the difference between the compound interest on £1357. 12s. 6d., at 5 per cent., for 2 years 5 months 19 days, and the compound interest on the same sum, for the same time, and at the same rate per cent., the interest being in this last case paid quarterly.

10 Find the discount on £1711. 10s., due in 3 years 7 months 16 days, at 4⅓ per cent., and show the truth of the answer.

C 8.

1 If a gentleman's estate produce £479. 10s. a year, and the land tax be assessed at 2s. 5½d. per pound; what is his net annual income?

2 A grocer bought 3 chests of tea, each weighing 1 cwt. 3 qrs. 13½ lbs., for 25 guineas per cwt.; he sells one-fourth of it at 4s. 5½d. per lb.; how must he sell the remainder per lb. so as to clear exactly £7. 10s. by the purchase?

3 From three times 1 lb. 3 ozs. 4 drs. 1 sc. 17½ grs., take five times 2 ozs. 2 drs. 2 sc. 2¼ grs., and find the value of the remainder at 1¼d. per grain.

4 The circumference of the earth is nearly 25,000 miles; at what rate per hour is a person who lives on the equator carried along, supposing the earth to make one complete revolution in 23 hours 56 minutes?

5 Find the difference of the rates at which two persons are carried along by the daily revolution of the earth, one of whom lives at the equator and the other in London, where the distance round the earth, measured on the parallel of latitude, is about 15550 miles.

6 What will a broker charge for the transfer of shares to the amount of £529. 14s. 7d., at ⅛ per cent.?

7 How much must be paid to insure £1250. 4s. 8d., at 12s. 7d. per cent.?

8 Find the difference between the simple and the compound interest on £1175. 2s. 7d., for 3 years 3 months 10 days, at 2½ per cent.

9 A merchant buys 187½ gallons of brandy, at 27s. 6½d. per gallon; 239¼ gallons, at 29s. 4½d. per gallon; and 357¾ gallons, at 25s. 7¾d. per gallon; how must he sell the mixture per gallon to gain £3. 7s. 5d. by the purchase?

10 What is the present worth of a legacy of £2000, to be paid in 2 years 7 months, at 3½ per cent.? and prove the truth of the answer.

C 9.

1 How much sugar could be bought for £107. 17s. 10d., if 2 cwt. 1 qr. 1½ lb. cost £5. 2s. 10½d.?

2 Find the value of 147 lbs., at ¼d. per lb.; 2176 lbs., at 3 guineas per cwt.; and 27 cwts. 1 qr. 11¼ lbs., at 7½d. per lb.; and add all the answers together.

3 Change 171,098 farthings into twopences, fourpences, shillings, sixpences, threepences, half-crowns, crowns, half-sovereigns, and florins, in the order in which they are named.

4 What sum will amount to £425. 19s. 6d., in 7½ years, at 2¼ per cent.? Prove it.

5 At what rate per cent. will £749. 12s. 8d. amount to £942. 4s. 10d. in 4¾ years?

6 In what time will £243. 2s. 7d. amount to £373. 4s. 10½d., at 2¾ per cent.? Prove it.

7 Find the difference between the simple and the compound interest on £829. 12s. 4d., for 4 years 7 months 19 days, at 2⅓ per cent.

8 A cannon ball, at its swiftest velocity, moves through nearly 2000 feet in a second of time; in what time would one travel from the earth to the sun at that rate, supposing the distance to be 95 millions of miles?

9 The rent of a farm is £370 per annum, and it is assessed at ¾ of this; the poor's rate is 3s. 4d. in the pound, the highway rate 8d. in the pound, and the church rate 2d. in the pound; how much does the tenant pay for rent and taxes yearly?

10 Bought goods to the amount of £425. 10s. on the 1st of February, to be paid for on the 1st of November following; what present money will discharge the debt, allowing 3¾ per cent.? Illustrate by this question the difference between interest and discount.

C 10.

1 Change one hundred and sixty-seven millions, one thousand and nine barley-corns into miles, and prove it.

2 How many times will a carriage wheel, whose diameter is 3 feet 10 inches, turn in passing over 191 miles, if the circumference = three and one-seventh times the diameter?

3 Suppose a cannon ball issues from a gun, with a velocity of 1500 feet per second, and that light travels from the sun to the earth (ninety-five millions of miles) in 8⅓ minutes; what is the ratio of one velocity to the other?

4 Find the simple interest on £1746. 2s. 10d., for 4 years 9 months 12 days, at 5⅓ per cent.

5 How far will 100 millions of guineas reach if laid in a straight line, touching each other, supposing every guinea to be ¾ inch in diameter?

6 A grocer bought 3 chests of tea, one weighing 2 cwts. 1 qr. 19½ lbs., another 1 cwt. 3 qrs. 26½ lbs., and the third 2 cwts. 2 qrs. 16¼ lbs., for £23. 10s. 7d. per cwt.; what must he sell it at per lb. to clear 10 guineas by the purchase?

7 Find the brokage on £1752. 10s., at 3s. 4½d. per cent.

8 A farmer insures his stock for £2335; what will his insurance amount to at 1s. 11d. per cent.?

9 Find the compound interest on £579. 7s. 6d., for 2 years 1 month 17 days, at 4 per cent., the interest being paid quarterly.

10 The earth makes its daily revolution in 23 hours 56 minutes; through how much space will any place on the equator be carried in 2 hours 17 minutes, if the circumference at the equator be 25,000 miles?

EQUATION OF PAYMENTS.

1 A tradesman owes a merchant £250, to be paid in 5 months, £200 in 6 months, and £470 in 8 months; at what time may the whole be paid at one payment without injury to either?

2 What is the equated time for making the following payments at once:—£74 at 3 months; £96. 10s. at 5 months; and £74. 15s. 6d. at 9 months.

3 A merchant owes another £1750, which is to be paid as follows;—£250 to be paid down, ⅓ of the remainder in 4 months, ⅓ in 6 months, and the remainder in 10 months; what would be the proper time for paying all in one payment?

4 A owes B £650, which was agreed to be paid in the following manner:—£250 in 7 months, £300 in 9 months, and the remainder at 11½ months; find the equated time for paying the whole.

5 Find the equated time for making the following payments:—£74. 5s. 6d. at 3½ months, £59. 19s. 11d. at 5 months, and £84. 7s. 6d. at 7½ months.

6 Find the equated time of payment of £756, ⅓ of which is due in 3½ months, ⅛ in 4½ months, and the remainder in 7 months.

7 If I have to pay a tradesman £17. 10s. in 2½ months, £18. 7s. 6d. in 4 months, and £57. 8s. in 9 months; in what time ought the whole to be paid at one payment, without loss to either party?

8 A person holds a bill for £20. 7s. 10d., at 2 months, one for £17. 7s. 8d. at 4 months, and another for £47. 10s. 10d. at 6 months; at what date ought a bill to be given for the whole?

9 A debt of £569 was to have been paid as follows:—£179. 10s. at 47 days, £119. 7s. 4d. at 74 days, and the remainder at 3 months; but the parties afterwards agreed to have it paid at once; what would be the proper time for doing so?

10 At what date may I have a bill for £769. 10s. 7d. in exchange for the following notes:—£375. 7s. 8d., payable at 73 days; £276. 14s. 10d., payable at 117 days; and £117. 8s. 1d., payable at 146 days.

BARTER.

1 If I exchange 73 cwts. 1 qr. 17 lbs. of sugar, worth 5½d. per lb., for 357 yds. 1 qr. of cloth; what is the cloth valued at per yard?

2 If I exchange 73 cwts. 1 qr. 17 lbs. of sugar, worth £2. 17s. 10½d. per cwt., for 257 yds. 3 qrs. of cloth, and 50 guineas in cash; what is the cloth valued at per yard?

3 How many yards of linen, at 3s. 7½d. per Flemish ell, must be given as an equivalent for 117 stones of soap, at 5¾d. per lb.?

4 Sold goods for £169. 10s. 6d., and received 100 guineas in cash, and the balance in scissors, at 17s. 6½d. per dozen pairs; how many pairs had I?

5 Sold goods for £156. 7s. 8d., and received £75. 10s. 6d. in cash, and 127 dozens of penknives as a full equivalent; what were the penknives valued at per dozen?

6 Changed 407 qrs. 3 bus. 1 pk. of malt, for 450 guineas and 417 galls. 2 qts. of brandy; what was the brandy valued at per gallon?

7 Sold 351 qrs. 2 bus. 2 pks. of wheat at 63s. 6½d. per qr., and received half the value in money and the remainder in tea, at £25. 17s. 10d. per cwt.; how much tea had I?

8 What is cloth valued at per yard, if a tradesman receive 749½ yards for 97 cwt. 3 qrs. 17½ lbs. of sugar, at £3. 7s. 5d. per cwt.?

9 Bought 17 cwt. 1 qr. 19½ lbs. of soap, at 4¼d. per lb., for which I am to pay two-thirds in cash, and the remainder in sugar at £2. 7s. 6½d. per cwt.; how much sugar shall I have to give?

10 Bartered 47 cwt. 3 qrs. 19 lbs. of coffee, at 1s. 4½d. per lb., together with 50 guineas in cash, for silk, at 4s. 5½d. per yard; how much silk ought I to receive?

11 Two merchants barter: one has 17 cwt. 1 qr. 11½ lbs. of tea, worth 3s. 7½d. per lb., and 9 cwt. 2 qrs. 12¼ lbs. of coffee, worth 1s. 2½d. per lb., for which the other gives him 317 yds. 1 qr. 1 nl. of cloth, worth 9s. 7½d. per yard, and the balance in silk, at 7s. 4½d. per yard; how much silk will be required to make the exchange a fair one?

12 How much tobacco, at £7. 5s. 6d. per cwt., together with £20. 7s. 3d. in cash, will be an equivalent for 10 cwt. 1 qr. 11½ lbs. of tea, worth 4s. 2½d. per lb.?

13 Bought 117 qrs. 3 bushels of wheat, for which I gave 17 cwt. 1 qr. 11 lbs. of sugar, worth 5¼d. per lb.; 17 cwt. of starch, worth 1s. 1½d. per lb.; and £205. 6s. 8d. in cash; what was the wheat valued at per quarter?

14 Received in barter 114 yds. 1 qr. 3 nls. of cloth, worth 3s. 2½d. per yard, and returned 74½ lbs. of tea, worth 3s. 5½d. per lb., and 56½ lbs. of coffee; what was the coffee valued at per lb.?

15 Sold 117 gross of razors, worth 1s. 10d. per pair, and 74 gross of scissors, at 17s. 2½d. per dozen, and received ⅓ in cash, ¼ in pepper, at 3s. 7d. per lb., and the rémainder in sugar, at £2. 7s. 10½d. per cwt.; how much of each was received?

16 How much cheese, at 31s. 5d. per cwt., must A give B for £20 in cash, and 44 cwt. 16¼ lbs. of raisins, at 4¾d. per lb.?

17 How many yards of silk velvet, at 14s. 5½d. per yard, besides 79¼ yards, at 17s. 9½d. per yard, must I give for 27 cwt. 2 qrs. 17½ lbs. of currants, at 5¾d. per lb., and £17. 10s. 8½d. in cash?

18 How many gallons of rum, at 16s. a gallon, together with 118 gallons, at 18s. a gallon, must A give B for 113 cwts. 1 qr. 11 lbs of coffee, at 1s. 6½d. per lb.?

19 How many pieces of silk, each 19¼ yards, may be bought for £280, if the silk be valued at 4s. 6½d. per English ell?

20 A tradesman bartered 179 cwt. 3 qrs. 17 lbs. of sugar, worth £2. 17s. 9d. per cwt., for 13 pockets of hops, each, 6 cwt. 3 qrs. 13½ lbs., worth £4. 17s. 5d. per cwt., and the balance in soap, at 5½d. per lb.; how many stones of soap ought he to receive?

PROFIT AND LOSS.

Bought goods at				*and*	*Sold at*			*Bought goods at*				*and*	*Sold at*		
	£.	s.	d.		£.	s.	d.		£.	s.	d.		£.	s.	d.
1	1	7	6	...	1	14	4½	6	0	9	4½	...	0	7	6
2	0	5	10½	...	0	3	11	7	1	1	8	...	0	19	6
3	0	6	9	...	0	4	6	8	0	15	3	...	1	0	4
4	2	3	6	...	2	8	11¼	9	3	3	7	...	3	14	2¾
5	1	17	10	...	1	13	1¼	10	0	16	9	...	0	12	7¾

Find the gain or loss per cent. in each case.

Bought goods at				*and*	*Sold to gain*		*Bought goods at*				*and*	*Sold to gain*	
	£.	s.	d.		£.			£.	s.	d.		£.	
11	5	17	6	...	10	p. c.	16	12	15	8	...	25	p. c.
12	0	19	7	...	5	...	17	0	17	6	...	17½	...
13	1	17	6	...	17½	...	18	4	19	8¼	...	33⅓	...
14	0	9	6	...	12½	...	19	1	12	7¼	...	20	...
15	2	17	9¾	...	40	...	20	0	19	10	...	12½	...

Bought goods at				*and*	*Sold to lose*		*Bought goods at*				*and*	*Sold to lose*	
	£.	s.	d.		£.			£.	s.	d.		£.	
21	4	6	8	...	10	p. c.	26	1	4	6	...	12½	p. c.
22	0	12	10½	...	16⅔	...	27	7	10	8¾	...	40	...
23	1	17	6	...	17½	...	28	21	6	6¾	...	20	...
24	19	15	6¼	...	20	...	29	12	7	6	...	10	...
25	0	18	6	...	33⅓	...	30	0	14	10½	...	33⅓	...

Find the selling price in each case.

Sold goods at				*and*	*Gained*		*Sold goods at*				*and*	*Gained*	
	£.	s.	d.		£.			£.	s.	d.		£.	
31	2	13	5¼	...	12½	p. c.	36	5	7	9¾	...	15	p. c.
32	22	5	7½	...	15	...	37	10	18	0	...	9	...
33	0	17	6	...	5	...	38	11	3	0¾	..	7½	...
34	7	13	9	...	2½	...	39	7	0	0	...	40	...
35	10	1	6¾	...	7½	...	40	21	16	8	...	33⅓	...

Sold goods at				*and*	*Lost.*		*Sold goods at*				*and*	*Lost*	
	£.	s.	d.		£.			£.	s.	d.		£.	
41	5	0	10¼	...	17½	p. c.	46	16	9	4½	...	15	p. c.
42	18	8	1½	...	5	...	47	0	9	4½	...	25	...
43	2	1	6¾	...	12½	...	48	26	7	10	...	50	...
44	17	9	6	...	10	...	49	7	2	6	...	5	...
45	8	18	5¼	...	7½	...	50	0	15	10	...	20	...

Find the prime cost in each case.

51 Bought sugar at 8d. per lb.; how must I sell it per lb. to clear 25 per cent., and how must I sell it per lb. to lose the same?

52 Bought sugar at £2. 12s. 6d. per cwt.; how must I sell it per lb. to clear 15 per cent.?

53 Bought sugar at £2. 17s. 6d. per cwt.; how must I sell it per lb. to lose 17½ per cent.?

54 Bought tea at 4s. 6d. per lb.; how must it be sold per cwt. to clear 12½ per cent.?

55 Bought tea at 3s. 4d. per lb.; how must it be sold per lb. to clear 20 per cent., and how must I sell it per cwt. to lose the same?

56 Bought cloth at 7s. 4½d. per yard, and sold it for 9s. 2d. per yard; what did I gain per cent.?

57 Bought cloth at 8s. 2½d. per yard, and sold it at 10s. 6d. per yard; what do I clear per cent., and how much should I clear by the sale of 412½ yards?

58 Bought cheese at 9½d. per lb., but it being damaged I was obliged to sell it at 7¾d. per lb.; what do I lose per cent., and how much should I lose by the sale of 2 cwt. 1 qr. 11½ lbs.?

59 Sold cloth at 7s. 6½d. per yard, and thereby cleared 10 per cent.; what did I give for it?

60 Sold coffee for £6 per cwt., and thereby gained 25 per cent.; what did I give for it, and what did I gain by the sale of 3 cwt. 3 qrs. 19½ lbs.?

61 Sold a lot of copy books for 6s. 5½d. per dozen, and cleared 10 per cent. by the sale; what did I give for them?

62 Sold goods at 5 guineas per cwt., and thereby lost 17½ per cent.; what did I give for them per cwt., and what do I lose by the sale of 11 cwt. 3 qrs. 19 lbs.?

63 Sold goods at £7. 14s. 8d. per cwt., and lost 9 per cent.; what did I give for them per lb.?

64 Sold goods at 9½d. per lb., and lost 25 per cent. by the sale; how did I buy them per cwt.?

65 Bought goods at 6s. 10½d. per lb., and sold them at £33. 7s. 6d. per cwt.; what do I gain or lose per cent., and how much by the sale of 2 cwt. 1 qr. 4 lbs.?

66 What ought I to charge per yard for cloth to enable me to throw off 7½ per cent. and receive 7s. 4½d. per yard net?

67 What ought I to charge for sugar per cwt. to receive 6½d. per lb., after throwing off 10 per cent. discount?

68 What ought I to charge per lb. for tea to receive £25. 7s. 9d. per cwt., after throwing off 12½ per cent.?

69 If 10 per cent. be gained by selling cloth, at 12s. 6d. per yard, how should it be sold per yard to clear 22½ per cent.?

70 If 7½ per cent. be lost by selling cloth at 7s. 3d. per yard, how should it be sold per yard to clear 15 per cent.?

71 If 12½ per cent. be lost by selling cheese at £2. 17s. 7d. per cwt., how should it be sold per lb. to clear 12½ per cent.?

72 If 12½ per cent. be gained by selling wheat at £2. 7s. 6d. per quarter, how should it be sold per quarter to lose 12½ per cent.?

73 If 25 per cent. be gained by selling goods at 3 guineas per cwt., how should they be sold per cwt. to clear 10 per cent.?

74 If 25 per cent. be gained by selling goods at £4. 19s. 8d. per cwt., how should they be sold per lb. to clear 12½ per cent.?

75 If tobacco be sold at 4d. per ounce, and 12½ per cent. be gained, what was the prime cost per cwt.?

76 If tobacco be sold at 4d. per ounce, and 12½ per cent. be lost, what was the prime cost per lb.?

77 Bought brandy at 22s. 7d. per gallon, and sold at 27s. 11½d. per gallon; what was the gain per cent.?

78 Sold brandy at 27s. 4½d. per gallon, and cleared 17½ per cent., but I ought to have cleared 25 per cent.; for how much under its proper value was it sold?

79 Sold tea at £23. 4s. 6d. per cwt., and lost 5 per cent., but I ought to have cleared 17½ per cent. by the sale; for how much under its just value was it sold?

80 A stationer sold quills at 10s. 6d. per thousand, and cleared ⅓ of the money; he raises the price to 12s. 9½d. per thousand; how much does he clear per cent. by the latter price?

PARTNERSHIP.

1 Two merchants enter into partnership: one advances £1700 and the other £1950; they clear £759. 10s; how should this be divided between them?

2 Two merchants enter into partnership: one advances £1575, the other £980; they lose £547; how should this loss be divided between them?

3 Three persons engage in an undertaking: one advances £749. 10s., another £568, and the third £942. 10s.; they clear £1000; divide this fairly among them.

4 Divide 10 guineas among four youths, in proportion to their ages, which are 8½ years, 9¾ years, 11 years, and 13 years.

5 A tradesman owes one person £513. 10s., another £161. 2s. 7d., and another £91. 7s. 10½d.; he fails, and his effects will only realise £320. 17s.; how should this be divided among his three creditors?

6 Divide £379. 10s. amongst four persons, in the proportion of 4, 5, 6, and 7 respectively.

7 A ship, laden with 759 casks of wine, was overtaken by a storm, and the master was obliged to lighten it by throwing 117 casks overboard; now 174 casks were for one merchant, 411 casks for another, and the remainder for a third: how should the loss be borne by them?

8 Three merchants engage in business: one advances £2749, the second £1944, and the third £4688: the second was the acting partner, and was to have £500 per annum for managing the business; at the end of two years they take stock, and find their profits to be £4766. 7s. 6d: divide this fairly amongst them.

9 A gentleman dying, leaves to one son £779. 10s., to another £1000, and to another £674, desiring that 50 guineas should be paid without deduction to his executor: his estate is found to realise only £2000: how should this be divided among them, according to the intention of the father?

10 Four parishes are valued for rateable purposes as follows: the first at £17,060; the second at £7680; the third at £8697. 10s.; and the fourth at £3565. 15s.: suppose a rate of 9d. in the £ be laid, what will it realise? and what will be the fair proportion for each parish to furnish, if a call of £1576. 10s. 6d. be made for the relief of the poor for the general union?

11 Three merchants were partners; one advanced £794 for 8 months; the second £1179. 10s. for 6½ months; and the third £700 for 9 months; they gained £757. 8s. 10d.: how much should each receive?

12 A tradesman commenced business on the 1st of January with a capital of £1678: on the 1st of April following he took in a partner with a capital of £1000; and on the 1st of May he took in a second partner with a capital of £1710; at the end of the year they had gained £1869. 10s. Find each person's share of the gain.

13 A and B were partners; A advanced £720 for 4 months, and then £550 more; B advanced £600 for the first 6 months, and then £300 more; A was to have 10 per cent. of the profits for managing the business; at the end of the year they had gained £1177. 10s. 10d.; how should this be divided between them?

14 A, B, and C were partners; A advanced £467 for 7½ months; B, £572. 10s. for 9 months; and C £256 for 12 months; at the end of the year they have cleared £942. 7s.: divide this fairly among them.

15 Three tradesmen join in business; D puts in stock £247. 7s. 9d. for 4½ months; E, £344. 10s. for 5½ months, and F, £176. 4s. 9d. for 12 months; they gained £374. 17s. What is each man's share of the gain?

16 A, B, and C, rent a field for £21. 7s. 5d: A puts in 75 sheep for 6 months; B puts in 110 sheep for 4 months; and C 47 sheep for 5 months; what ought each to pay of the rent?

17 A and B join in business; A puts in £472; and B £648; at the end of 5 months A withdraws ⅓ of his capital, and at the end of 6 months B withdraws ⅓ of his; C then joins them with a capital of £469: at the end of the year they have gained £766. 17s.; how ought this to be divided among them?

18 A and B entered into partnership; A advanced £860, and at the end of 7 months £744 more; B advanced at first £570, and at the end of 4 months £2000 more, but he took out £950 at the end of 3 more months: at the year's end they had gained £1410; what should each receive?

19 A gentleman bequeaths £500 to his 3 servants, to be paid in proportion to their wages and the length of time they had been in his service: the footman had £25 a-year, and had been with him 7 years; the housemaid had 12 guineas a-year, and she had been with him 5 years; the cook had £15. 10s. a-year, and she had been with him 9½ years; what ought each to receive?

20 Three merchants join in business for 2 years: A puts in stock £400, and at the end of 3 months £300 more; at the end of 9 months he takes out £175 but he puts in that, and £500 more at the end of 14 months, and at the end of 17 months he takes out £360. 10s.; B puts in stock 700 guineas, and at the end of 12 months 500 guineas more, but withdraws half of his capital at the end of 15 months; C puts in £1000, and at the end of 4 months withdraws £460. 10s., at the end of 10 months he puts in £700, and at the end of 16 months £410 more; by agreement A was to have 5 per cent. of the profits for managing the business; at the end of 24 months they take stock, and find they have cleared £3755; how should this be divided among them?

STOCKS.

Find the value in sterling of the following sums, in the stocks named.

	Stock. £		per cents. £				Stock. £		per cents. £		
1	2473	in the	4	at	94	9	674	...	4½	at	97⅛
2	756	...	4½	...	93	10	7410	...	4	...	90¼
3	947	...	3	...	76	11	556	...	3½	...	83¼
4	3174	...	3½	...	76½	12	427	...	3	...	77½
5	749	...	3	...	75¼	13	678	...	3	...	84¼
6	927	...	3½	...	81	14	742	...	3½	...	91⅝
7	876	...	4½	...	90⅕	15	2477	...	4½	...	97½
8	767	...	4	...	89⅜						

Find how much stock can be purchased for the sums named below, in the given kinds of stock, and at the prices named.

		£.	s.	d.				
16	For	740	7	6	in the	3	per cents.	at 84
17	...	495	10	0	...	3½	...	... 77½
18	...	643	0	0	...	3	...	... 82¼
19	...	1579	10	0	...	4	...	... 85⅛
20	...	4713	0	0	...	4½	...	... 89¼
21	...	687	0	0	...	3½	...	... 74⅛
22	...	942	0	0	...	4½	...	... 90⅝
23	...	874	10	0	...	3	...	... 74½
24	...	426	15	0	...	3½	...	... 77⅜
25	...	279	7	6	...	3½	...	... 79⅝
26	...	847	17	6	...	4½	...	... 96¼
27	...	900	0	0	...	4	...	... 91½
28	...	1000	0	0	...	3	...	... 76⅛
29	...	7487	10	0	...	4½	...	... 92¾
30	...	354	7	6	...	3½	...	... 87⅜

Find what return per cent. will be obtained by purchasing in the following stocks, at the prices named.

		per cents.		per cent.			per cents.		per cent.
31	In the	3	at	70	36	In the	3½	at	82¼
32	...	3½	...	76½	37	...	4	...	86½
33	...	3	...	72¼	38	...	4½	...	99⅝
34	...	4	...	80½	39	...	4½	...	97⅜
35	...	4½	...	91½	40	...	3½	...	86⅞

Find what return per cent. will be obtained by purchasing in the following stocks, at the prices named.

		per cents.		*per cent.*			*per cents.*		*per cent.*
41	in the	4	at	85⅛	44	in the	3	at	74⅞
42	...	3½	...	79⅜	45	...	4½	...	96⅞
43	...	3	...	76⅝					

Find what annual income would be derived by investing the following sums in the stocks named, and at the prices given.

	£.	s.	d.					
46	749	10	0	in the	3½	per cents.	at	77¼
47	4177	10	0	...	3	...	...	72⅛
48	2416	7	6	...	4	...	...	82⅛
49	974	15	0	...	4½	...	...	95¼
50	846	0	0	...	3½	...	...	87⅜
51	798	0	0	...	4½	...	...	91⅝
52	687	10	0	...	3	...	...	71⅞
53	1749	10	0	...	3½	...	...	76¾
54	3477	0	0	...	4½	...	...	87½
55	4716	10	0	...	3½	...	...	81½
56	689	0	0	...	3	...	...	76⅛
57	574	0	0	...	4½	...	...	87⅞
58	989	0	0	...	3½	...	...	78¼
59	4787	10	0	...	4	...	...	84½
60	6477	10	0	...	4½	...	...	99⅜

Find how much must be invested in the following stocks, at the given prices, to produce the annual incomes named.

		per cents.				£.	
61	In the	3	at	70½	to produce	117	per annum.
62	...	3½	...	75¼	...	140	...
63	...	3	...	71½	...	86	...
64	...	4	...	82⅛	...	79	...
65	...	4½	...	87⅜	...	127	...
66	...	4	...	81¾	...	150	...
67	...	3½	...	79⅜	...	167	...
68	...	3½	...	77½	...	95	...
69	...	4½	...	92⅛	...	115	...
70	...	4	...	91⅜	...	146	...
71	...	3	...	71½	...	200	...
72	...	4½	...	95¾	...	174	...
73	...	3½	...	87⅛	...	86	...
74	...	3½	...	85⅞	...	250	...
75	...	4½	...	96⅞	...	177	...

76 What sum will purchase £760 stock, at 94⅜ per cent.?

77 How much stock can be bought for £1170. 10s. in the 3½ per cents., at 87⅝?

78 If I invest £3510 in the 3 per cents. at 64½, what will be my annual income?

79 A person wishing to invest £1756. 10s. in the stocks is in doubt which to prefer, the 3 per cents., at 95⅞, or the 4 per cents., at 100¾; which ought he to choose?

80 What price should the 3½ per cents. be at, that a purchaser may receive 5¼ per cent. for his money?

81 What will £749 stock cost me in the 4½ per cents. at 101⅞; brokage ⅛ per cent.?

82 If I purchase £1749. 10s. stock in the 4½ per cents. for £1407. 15s., what is the price of the stock per cent.?

83 If a person transfer £7469 stock from the 3½ per cents. at 85¼, to the 4½ per cents., at 97⅛; find the difference in his income.

84 How much stock at 107⅞ can be bought for £1174. 7s. 6d.?

85 How much can I obtain for £743 stock in the 3 per cents. when they are quoted at 71⅞?

86 How much will be required to be invested in the 4 per cents. when they are at 92⅜ to produce an annual income of £173. 10s.?

87 In which is it most profitable to invest, in the 4 per cents. at 76⅛, or in the 4½ per cents. at 84¾?

88 If £1749 stock in the 4 per cents. produces £91. 3s. 6d. per annum, what per centage does the holder secure for his money?

89 Find the value of a legacy of £2000 stock in the 4½ per cents. at 89⅞, deducting the duty of 2 per cent.

90 If the 3½ per cents. be at 90⅞, how much must a person invest in order that he may have a clear yearly income of £500, after paying an income tax of 7d. in the pound?

EXERCISES TO FRACTIONS.

D 1.

1 If 273 yds. 3 qrs. cost £74. 7s. 6d., for how much must 5 English ells 1 qr. be sold to clear £7. 5s. 7½d. by the whole?

2 In what time will £747. 10s. amount to £924. 15s. 6d., at 4¼ per cent. simple interest? Prove it.

3 If 4½ per cent. be gained by selling cheese at £4. 10s. 7d. per cwt., what will be the gain or loss per cent. if it be sold at 11½d. per lb.?

4 If 4½ per cent. be lost by selling cheese at £4. 10s. 7d. per cwt., what will be the gain or loss per cent. if it be sold at 11½d. per lb.?

5 A and B entered into partnership; A put in stock £1500, and at the end of 7 months £1500 more; B put in stock £1000, and at the end of 3½ months took out £250, but at the end of 7 months he put in that and £1550 more; at the end of 12 months they had gained £1577; what should each receive?

6 A person, after paying 7d. in the pound for income tax, has £1476. 7s. 6d. remaining; what had he at first? Prove the truth of the answer.

7 Bought goods at 4½d. per lb., and sold them at 50s. per cwt.; what is the gain per cent.?

8 An agent sold 749½ cwts. of sugar at £2. 7s. 5d. per cwt.; 427¼ cwts. of raisins at 6¼d. per lb., and 17 cwts. 3 qrs. 3 lbs. of soap at 50s. 7d. per cwt.; his commission is 13s. 4d. per cent.; how much should he remit to his employers?

9 Bought 23 cwts. 2 qrs. 17½ lbs. of soap at 47s. 5½d. per cwt., and paid ⅓ in cash, ¼ in scissors at 13s. 7d. per dozen, and the remainder in razors at £1. 7s. 10d. per dozen; how many of each kind should I give?

10 Find the present worth of £1756, to be paid in 2 years 7 months, at 3⅓ per cent., and prove the truth of the answer.

D 2.

1 What sum of money will in 3½ years amount to £747. 12s. 6d., at 4¼ per cent. simple interest? Prove it.

2 What must be paid to insure £2500, at 4s. 7½d. per cent.?

3 How many gallons of brandy, at 33s. 6d. per gallon, together with 57 gallons at 29s. 8½d. per gallon, should A give B for 125 cwts. 1 qr. 11½ lbs. of coffee, at 1s. 1½d. per lb.?

4 Bought tea at 20 guineas per cwt.; how should it be sold per lb. to clear 3½ per cent., 7½ per cent., and 17½ per cent.? and how should it be sold per lb. to lose the same?

5 A person expends £2000 in railway shares at 9½ per cent. discount, and sells them at par; what does he gain by the transaction, and how much per cent.?

6 Find the value of 4746 lbs., at ¾d. per lb., at 7¾d. per lb., and at 1s. 1¼d. per lb., and add all the answers into one sum.

7 The fore wheel of a carriage is 3 ft. 6 in. in diameter, and the hind one 5 ft. 9 in.; how many more times will one revolve than the other in passing over 173½ miles, it being given that the circumference equals $3\frac{1}{7}$ times the diameter?

8 Find the difference between the simple and the compound interest on £943. 7s. 6d. for 2 years 9 months 19½ days, at 3⅓ per cent. per annum.

9 A bankrupt is only able to pay 1s. 3d. in the pound, and he pays £199. 7s. 10d.; what did he owe?

10 A bankrupt owes £7100. 7s. 10d., and his effects realize £3043. 0s. 6d.: what will he be able to pay in the pound?

D 3.

1 The difference of two numbers is 757, the greater of them is 1779; what is their sum?

2 The sum of two numbers is 9473, and the greater of them is 8172; what is the product of the sum by the difference?

3 Find the simple interest on £721. 2s. 6d., for 7 years 7 months 12 days, at 2½ per cent.

4 A person transfers £2500 stock from the 3½ per cents., at 97¼, to the 3 per cents. at 87¼; what difference is there in his income?

5 Sold goods at £27. 6s. 8d. per cwt., and lost 12½ per cent.; what did they cost per lb.?

6 Sold goods at 7¼d. per lb., and gained 12½ per cent.; what did they cost per cwt.?

7 A merchant buys 127½ gallons of brandy at £1. 9s. 7d. per gallon; 227½ gallons at £1. 11s. 6d. per gallon; and 176¼ gallons at £1. 8s. 10d. per gallon; if he add 20 gallons of water to the whole, what must he sell the mixture at per gallon to clear 15 guineas by the purchase, and how must he sell it per gallon to clear 15 per cent.?

8 A person invests his share of a legacy of £1200, which is one fourth, in the 3½ per cents., at 90¼; what will be his half-yearly dividend?

9 How much sterling shall I receive for £1127. 7s. 6d. in the 4½ per cents. at 101¾, brokage being ⅛ per cent.?

10 How much cheese, at 6¼d. per lb., together with £20 in cash, must A give B for 127 cwt. 17½ lbs. of raisins, at £2. 17s. 8d. per cwt.?

D 4.

1 Find the difference between the compound interest on £479. 17s. 6d., for 2¼ years, at 3 per cent., payable yearly, and the compound interest on the same sum, for the same time, at the same rate per cent., payable quarterly.

2 Find the value of 37 tons 17 cwts. 1 qr. 11½ lbs., at 1¼d. per lb., and also the value of the same quantity at 3½ guineas per cwt.

3 An agent bought for his employers 157½ yards of silk velvet, at 7s. 4½d. per yard; 4070½ yards of calico at 1¾d. per yard; and 1079 yards of linen at 1s. 10½d. per yard; his commission is 2s. 3d. per cent.; what is the amount of the invoice?

4 Sold 179½ yards of cloth for £47. 7s. 6d., and lost 2½ per cent. by the sale; what was the cost price per yard?

5 Sold 276¼ yards of cloth for £75. 10s., and gained 2¾ per cent. by the sale; what was the cost price per yard?

6 At what rate per cent., simple interest, will £720. 2s. 6d. amount to £936. 14s. 10d. in 4¾ years?

7 Find the difference in income between £5000 stock, in the 3½ per cents., and £5000 sterling, invested in the 3½ per cents., at 102⅔.

8 Twelve wedges of gold, weighing in all 26 lbs. 1 oz. 7 dwts. 17 grs., are to be coined into guineas; find the weight of each wedge, and the number of guineas which could be coined from the whole, if 3¾ guineas weigh one ounce.

9 What income would be derived half-yearly from £10,756 invested in the 3 per cents., at 73½?

10 Divide 7½ guineas among four youths according to their ages, which are 9¼ years, 7½ years, 15¾ years, and 18½ years.

D 5.

1 If a trader lose 1¼d. in 2s. 6d., what is that per cent.?

2 If a person transfer £17,000 stock from the 3½ per cents. at 99, to the 3 per cents. at 91⅜, what will be the difference in his income?

3 What will be the cost of £760 bank stock, at 91⅜, brokerage ⅛ per cent.; and what would be gained by selling out at 92¼, brokage as before, ⅛ per cent.?

4 Bought 157½ yards of cloth at 6s. 7½d. per yard, and sold one third at 6s. 9d. per yard, one third at 7s. 6½d., and the remainder at 5s. 10½d. per yard; what was the gain or loss per cent. upon the whole outlay?

5 A and B were partners; A advances £1750 and B £2447. 10s.; by agreement A was to have 2½ per cent. of the profits for managing the business; they clear £879. 10s.; how should this be divided between them?

6 Find the difference between the simple and compound interest on £427. 12s. 6d., for 3 years 5 months 10 days, at 2¾ per cent. per annum.

7 Sold 1 cwt. of goods for £59. 15s., at 15 per cent. profit; how much per cent. profit should I have gained if I had sold them for £64 per cwt., and what per cent. should I have gained or lost if I had sold them at 14s. 8½d. per lb.?

8 Change one hundred and one million, one thousand and seven cubic inches, into cubic yards.

9 What is the present worth of a legacy of £857. 10s., to be paid in 1 year 7 months, at 3⅓ per cent? Prove it.

10 How much tea at 3s. 5½d. per lb., together with 17 guineas in cash, should be given for 15 cwts. 1 qr. of sugar, at 7s. 8½d. per stone?

D 6

1 By selling an article for 5s. a tradesman lost 5 per cent.; what was the prime cost, and how must he sell it to clear 4½ per cent.?

2 How many pieces of silk, each 19¼ yards, may be bought for £180, at 4s. 6d. per English ell?

3 An agent sold 749 gross of scissors at 4 guineas per gross; 147 doz. of razors at 25s. 6d. per doz.; and 436 doz. of penknives at 14s. 6½d. per doz. Suppose he paid for carriage £1. 4s. 6d., and his commission to be 1¾ per cent., how much ought he to remit to his employers?

4 Sold goods at 15 guineas per cwt., and lost 17½ per cent.; what was the cost price per lb.?

5 In 1737 the 3-per-cents. rose to 107; and in 1797 they fell to 47⅜; calculate the interest received upon money invested at each of these prices respectively.

6 What sum will amount to £387. 7s. 7¼d. in 3¼ years, at 4½ per cent. simple interest? Prove it.

7 Find the difference between the simple interest on £442. 12s. 8d. for 2 years 10 months 15 days, at 3½ per cent; and the compound interest on the same sum, for the same time, at the same rate per cent., the interest being paid half-yearly.

8 Bought 24 cwt. 1 qr. 19½ lbs. of soap, at 4½d. per lb.; paid ⅔ in cash, and 27 doz. of knives; what were the knives valued at per dozen?

9 If I buy tobacco at 12 guineas per cwt., at what price per lb. must I sell it to gain 12 per cent.?

10 Bought 1120 yards of cloth at 10s. 6d. per yard, subject to a discount of 5 per cent. for cash, and sold it for 10s. 6d. per yard, but allowed 2½ per cent. for cash; what was my gain per cent., and how much upon the whole?

D 7.

1 Change 171,004 farthings into halfpence, twopences, sixpences, fourpences, florins, crowns, half-crowns, pence, and farthings, in the order in which they are named.

2 Find the insurance on £756. 18s. 6d., at 11s. 7½d. per cent.

3 In what time will £750 double itself, at 5 per cent. simple interest?

4 In what time will £750 treble itself, at 2½ per cent., simple interest?

5 A commission agent, whose charge is 2¼ per cent., effects sales in one year to the amount of £27,456. 14s. 6d.; suppose the expenses of his establishment to amount to £159. 7s. 6d., what profit does he make in the year?

6 In the alloy of which brass cannons are made, there are 11 parts tin to 100 of copper; how much tin would there be in a cannon weighing 22½ cwt.?

7 Suppose a lady to invest £2000 in the 3½ per cents., when they are at 90⅓, what income will she have, and what rate of interest will she receive for her money?

8 What sum will be required to purchase £759 in the 3-per-cents., at 91⅛, including the broker's commission of ⅛ per cent.?

9 If the 3-per-cents. be at 90½, how much must a person invest that he may have a yearly income of £375, after paying an income tax of 7d. in the pound?

10 A, B, and C invest £500, £450, and £850 respectively in a concern; by agreement, A was to have 17½ per cent. of the profits, and B 10 per cent. for managing the business; they clear £1747; how ought this to be divided among them?

D 8.

1 Bought 47 cwts. 3 qrs. 13½ lbs. of coffee at 1s. 4½d. per lb.; paid 100 guineas in cash, ⅓ of the remainder in cloth at 7s. 6½d. per yard, and the balance in silk velvet at 10s. 4d. per English ell; how much cloth and how many yards of velvet would be required to balance the account?

2 Bought 53 cwts. 1 qr. 19½ lbs. of sugar at 6s. 7d. per stone; paid 50 guineas in cash, and agreed to give as much cloth as would be equal to ⅓ of the remainder, and as much silk velvet as would equal the balance; the quantity of cloth given was 67¾ yards, and of velvet 111 yds. 1 qr. 1 nl.; what was the value per yard of each?

3 Sold 27 tons 1 cwt. 1 qr. of steel, worth £17. 7s. 6d. per ton, and received in return 150 gross of scissors worth 2½ guineas per gross, and the balance in razors at £1. 1s. 6d. per dozen; how many dozen of razors should I require?

4 Find the income arising from £2176 invested in the 3½ per cents. at 86¾, brokage ⅛ per cent.

5 Suppose a lady sell out £3156 stock from the 3 per cents. when they are quoted at 70⅜, how much sterling would she receive, brokage ⅛ per cent.?

6 Sold goods at £17. 10s. per cwt., and lost 12½ per cent.; what was the buying price per lb.?

7 Change 1,711,764 drams into tons, and prove it.

8 Bought goods at £17. 10s. per cwt.; how must I sell them per lb. to gain 12½ per cent.?

9 Bought goods at 10 guineas per cwt., and had 2½ per cent. allowed for cash, and sold them at 2s. 6d. per lb., with an allowance of 5 per cent. for cash; what was my gain per cent.?

10 Find the present worth of a legacy of £1726. 10s., to be paid in 2 years 2 months, at 2⅓ per cent., and prove the truth of the answer.

D 9.

1 Bought goods at 10¼d. per lb., and sold them at £5. 10s. 4d. per cwt.; what was the gain per cent.?

2 Bought goods at 10¼d. per lb., and sold them at £3. 7s. 6d. per cwt.; what was the loss per cent.?

3 Bought goods at £4. 4s. per cwt.; how must they be sold per lb. to gain 12½ per cent.?

4 Bought goods at £4. 4s. per cwt.; how must they be sold per lb. to lose 12½ per cent.?

5 A merchant buys 146¼ gallons of brandy at 25s. 7½d. per gallon, 153¼ gallons at 39s. 6d. per gallon, and 176¼ gallons at 27s. 9d. per gallon; how must he sell the mixture per gallon to gain 20 guineas by the purchase, and how must he sell it per gallon to clear 20 per cent.?

6 Find the difference between the compound interest of £673. 17s. 6d., at 3 per cent., for 2¼ years, the interest being paid quarterly, and the compound interest of the same sum, for the same time and at the same rate per cent., the interest being paid half-yearly.

7 If by selling an article at £17. 10s. per cwt., 15 per cent. is gained, what would be gained or lost per cent. by selling it at 2s. 10½d. per lb.? Prove the truth of the answer.

8 A person transfers £5000 stock from the 3¼ per cents. at 85¼, to the 3 per cents. at 79; find how much of the latter stock he will hold, and what alteration there will be in his income.

9 A merchant bartered 1107 Flemish ells 2 qrs. 1 nl. of silk velvet worth 4s. 7½d. per yard, for 50 guineas in cash, and sugar at 6s. 7½d. per stone; how much sugar ought he to receive?

10 Find the simple interest on £726. 9s. 6d. from January 11th, 1847, to November 13th, 1848, at 4¾ per cent.?

D 10.

1 A tradesman holds three bills for the following amounts: one for £156. 10s., due in 3 months; one for £227. 15s. 6d., due in 4½ months; and the third for £174. 10s., due in 7 months; at what date ought he to receive a bill for the whole amount to be an equivalent for the three?

2 Suppose a carriage wheel turns round 16,640 times in going from Cambridge to London, and the circumference of the wheel is 16 feet 6 inches, how far are those towns apart.

3 How much may a person spend in 146 days, if he wishes to lay by every year 30 guineas out of an income of £400.

4 A person has £1,200 in the 3½ per cents; how much must he have also in the 3 per cents. that his whole income may be £250, and what sum would he realize by selling the first out at 87⅓ and the second at 75⅛.

5 At what rate per cent., simple interest, will £759. 15s. 6d. amount to 1000 guineas in 2¼ years? Prove it.

6 In what time will £1742. 7s. 8d. amount to £1966. 10s. at 3¼ per cent. simple interest? Prove it.

7 The sum of £1375 is invested in the 3 per cent. consols, when the price of stock is 87¼; what income will it produce, and how would this income be changed if the stock were sold out at 91⅓ and the money put out at interest at 4¼ per cent.?

8 Find the present worth of a legacy of £3000, to be paid in 2¼ years, at 3¼ per cent., and prove the truth of the answer.

9 Bought 14 pieces of calico, each 127 yards, at 4½d. per yard, and sold it at a gain of £5. 11s. 1½d.; what was my gain per cent.?

10 A has a quantity of cloth worth seventeen shillings per yard, which he barters with B for 13 cwt. 2 qrs. of butter, worth 1s. 2d. per lb.; B sold the cloth at a guinea per yard; how much did he gain by the transaction?

VULGAR FRACTIONS.

Find the greatest common measure of—

1	323	and	437	11	969	and	1311
2	255	...	323	12	47970	...	68835
3	1311	...	1472	13	23551	...	89562
4	1431	...	1802	14	1292304	...	7962672
5	2147	...	2413	15	17309	...	14117
6	4218	...	6253	16	9177	...	10304
7	9594	...	13767	17	137241	...	172458
8	21312	...	46139	18	1418	...	10010
9	56169	...	100488	19	203966	...	846923
10	35938	...	72641	20	64239	...	72128

Find the least common multiple of—

1 2, 4, 6
2 2, 3, 4, 5
3 2, 3, 4, 6
4 2, 3, 4, 5, 6
5 3, 4, 5, 7
6 3, 5, 7, 9
7 3, 4, 7, 11
8 3, 4, 5, 6, 7, 8
9 7, 4, 6, 9, 5
10 5, 3, 7, 6, 10
11 6, 7, 9, 11, 15
12 7, 4, 5, 15, 18
13 2, 5, 9, 16, 14
14 4, 6, 11, 14, 15
15 2, 3, 4, 5, 6, 7, 8
16 2, 5, 11, 10, 15, 22
17 11, 4, 19, 12, 22, 7
18 6, 4, 3, 8, 19, 15
19 2, 4, 6, 8, 10 12, 14
20 7, 14, 21, 42, 84, 63

CASE 1.

Reduce to their lowest terms—

1 $\frac{17}{34}$ and $\frac{51}{68}$
2 $\frac{21}{84}$ ... $\frac{63}{72}$
3 $\frac{56}{88}$ ... $\frac{48}{82}$
4 $\frac{76}{95}$ ... $\frac{51}{187}$
5 $\frac{133}{152}$ ... $\frac{156}{182}$
6 $\frac{237}{869}$ ... $\frac{212}{689}$
7 $\frac{36227}{91633}$ ... $\frac{1872}{2223}$
8 $\frac{41719}{125157}$ ... $\frac{21176}{148232}$
9 $\frac{83438}{125157}$ ... $\frac{42352}{148232}$
10 $\frac{1371}{12339}$ ... $\frac{2141}{23551}$
11 $\frac{343}{637}$ and $\frac{266}{304}$
12 $\frac{147}{588}$ ... $\frac{253}{276}$
13 $\frac{3285}{2920}$ ... $\frac{1825}{2190}$
14 $\frac{1380}{1725}$ ... $\frac{4746}{5085}$
15 $\frac{2373}{3051}$ ... $\frac{187}{408}$
16 $\frac{60801}{88863}$ ... $\frac{64834}{115775}$
17 $\frac{108681}{398497}$ ... $\frac{31472}{377664}$
18 $\frac{323}{437}$ ... $\frac{1311}{1472}$
19 $\frac{8436}{12506}$ ... $\frac{21603}{36384}$
20 $\frac{199121}{210834}$ ... $\frac{401489}{443751}$

CASE 2.

Reduce to whole or mixed numbers—

1 $\frac{17}{3}$ and $\frac{19}{5}$
2 $\frac{14}{4}$ ... $\frac{16}{7}$
3 $\frac{15}{2}$ ... $\frac{21}{4}$
4 $\frac{17}{7}$ ... $\frac{19}{3}$
5 $\frac{153}{41}$ ... $\frac{113}{72}$
6 $\frac{111}{24}$ ... $\frac{317}{79}$
7 $\frac{413}{46}$ ... $\frac{217}{114}$
8 $\frac{614}{79}$ ... $\frac{1143}{118}$
9 $\frac{1411}{129}$ ... $\frac{2437}{152}$
10 $\frac{1264}{167}$ ... $\frac{4121}{714}$
11 $\frac{1426}{354}$ and $\frac{741}{142}$
12 $\frac{21141}{7134}$ ... $\frac{1129}{452}$
13 $\frac{6413}{3411}$ ... $\frac{21141}{11197}$
14 $\frac{14716}{11310}$ ... $\frac{4137}{1179}$
15 $\frac{21113}{3129}$ ... $\frac{14267}{7191}$
16 $\frac{141161}{21134}$ ... $\frac{94197}{32141}$
17 $\frac{126149}{27411}$ ... $\frac{1141186}{614827}$
18 $\frac{614134}{201147}$ ... $\frac{200146}{11957}$
19 $\frac{142346}{27534}$ ... $\frac{1401171}{351923}$
20 $\frac{1864131}{231779}$ ... $\frac{417468}{71994}$

CASE 3.

Reduce to improper fractions—

1	$7\frac{2}{5}$	and	$4\frac{2}{7}$	11	$17\frac{7}{17}$	and	$27\frac{4}{13}$
2	$4\frac{1}{7}$	...	$11\frac{1}{4}$	12	$24\frac{4}{14}$	...	$44\frac{9}{17}$
3	$9\frac{3}{5}$	...	$6\frac{1}{8}$	13	$85\frac{1}{13}$	...	$147\frac{2}{7}$
4	$7\frac{4}{11}$	...	$8\frac{2}{3}$	14	$186\frac{4}{9}$	...	$841\frac{3}{14}$
5	$17\frac{1}{9}$	...	$24\frac{1}{4}$	15	$741\frac{7}{16}$	...	$439\frac{6}{19}$
6	$14\frac{3}{7}$	...	$19\frac{1}{9}$	16	$311\frac{7}{18}$	...	$114\frac{23}{27}$
7	$44\frac{1}{5}$	...	$76\frac{3}{11}$	17	$686\frac{19}{21}$	...	$747\frac{17}{106}$
8	$19\frac{2}{7}$	...	$87\frac{1}{15}$	18	$1147\frac{1}{19}$	...	$2104\frac{3}{37}$
9	$73\frac{5}{6}$	...	$36\frac{4}{5}$	19	$8114\frac{2}{37}$	...	$7716\frac{19}{43}$
10	$29\frac{3}{7}$	...	$54\frac{1}{11}$	20	$11716\frac{2}{19}$	...	$141\frac{1}{107}$

CASE 4.

Reduce to their least common denominators—

1	$\frac{2}{3}$	and	$\frac{3}{4}$		21	$\frac{4}{13}$,	$\frac{1}{34}$,	$\frac{3}{17}$		
2	$\frac{1}{4}$	...	$\frac{1}{7}$		22	$\frac{5}{19}$,	$\frac{7}{104}$,	$\frac{6}{13}$		
3	$\frac{1}{9}$	...	$\frac{2}{7}$		23	$\frac{2}{17}$,	$\frac{7}{133}$,	$\frac{4}{13}$		
4	$\frac{1}{3}$	...	$\frac{3}{5}$		24	$\frac{5}{19}$,	$\frac{1}{22}$,	$\frac{2}{11}$		
5	$\frac{4}{7}$	...	$\frac{2}{9}$		25	$\frac{1}{17}$,	$\frac{8}{75}$,	$\frac{3}{15}$		
6	$\frac{5}{8}$	...	$\frac{7}{9}$		26	$\frac{7}{43}$,	$\frac{1}{86}$,	$\frac{3}{13}$		
7	$\frac{6}{7}$	...	$\frac{2}{3}$		27	$\frac{1}{14}$,	$\frac{1}{15}$,	$\frac{3}{19}$		
8	$\frac{1}{3}$,	$\frac{3}{7}$,	$\frac{1}{5}$		28	$\frac{6}{13}$,	$\frac{1}{16}$,	$\frac{6}{17}$		
9	$\frac{2}{5}$,	$\frac{1}{9}$,	$\frac{1}{7}$		29	$\frac{7}{29}$,	$\frac{7}{30}$,	$\frac{7}{31}$		
10	$\frac{1}{6}$,	$\frac{1}{7}$,	$\frac{1}{8}$		30	$\frac{1}{15}$,	$\frac{1}{19}$,	$\frac{1}{21}$,	$\frac{1}{23}$	
11	$\frac{2}{5}$,	$\frac{2}{7}$,	$\frac{2}{9}$		31	$\frac{3}{17}$,	$\frac{3}{13}$,	$\frac{3}{11}$,	$\frac{3}{25}$	
12	$\frac{3}{4}$,	$\frac{4}{5}$,	$\frac{5}{6}$		32	$\frac{23}{117}$,	$\frac{23}{118}$,	$\frac{23}{119}$,	$\frac{33}{111}$	
13	$\frac{1}{7}$,	$\frac{1}{8}$,	$\frac{1}{9}$		33	$\frac{1174}{2141}$,	$\frac{1816}{7111}$,	$\frac{91141}{14173}$		
14	$\frac{6}{7}$,	$\frac{6}{15}$,	$\frac{6}{11}$		34	$\frac{2}{7}$,	$\frac{2}{27}$,	$\frac{2}{37}$		
15	$\frac{2}{17}$,	$\frac{2}{13}$,	$\frac{2}{15}$,	$\frac{2}{19}$	35	$\frac{2}{3}$,	$\frac{2}{9}$,	$\frac{2}{15}$,	$\frac{2}{21}$,	$\frac{2}{27}$
16	$\frac{1}{11}$,	$\frac{1}{12}$,	$\frac{1}{13}$,	$\frac{1}{14}$	36	$\frac{3}{5}$,	$\frac{3}{10}$,	$\frac{3}{20}$,	$\frac{3}{25}$,	$\frac{3}{35}$
17	$\frac{5}{156}$,	$\frac{4}{157}$,	$\frac{5}{158}$,	$\frac{6}{151}$	37	$\frac{4}{7}$,	$\frac{4}{21}$,	$\frac{4}{35}$,	$\frac{4}{49}$,	$\frac{4}{63}$
18	$\frac{217}{351}$,	$\frac{241}{116}$,	$\frac{74}{111}$,	$\frac{151}{4117}$	38	$\frac{5}{8}$,	$\frac{5}{16}$,	$\frac{5}{24}$,	$\frac{5}{32}$,	$\frac{5}{48}$
19	$\frac{2}{7}$,	$\frac{2}{19}$,	$\frac{2}{21}$,	$\frac{2}{38}$	39	$\frac{17}{113}$,	$\frac{19}{211}$,	$\frac{21}{421}$,	$\frac{24}{377}$	
20	$\frac{1}{13}$,	$\frac{1}{16}$,	$\frac{1}{17}$,	$\frac{1}{18}$	40	$\frac{56}{111}$,	$\frac{57}{222}$,	$\frac{58}{333}$,	$\frac{59}{444}$	

CASE 5.

Add together the following fractions—

1 $\frac{1}{3}+\frac{1}{7}$
2 $\frac{2}{5}+\frac{1}{7}$
3 $\frac{1}{7}+\frac{2}{3}$
4 $\frac{2}{5}+\frac{1}{5}$
5 $\frac{1}{9}+\frac{3}{9}$
6 $\frac{1}{7}+\frac{1}{5}$
7 $\frac{2}{3}+\frac{3}{5}$
8 $\frac{1}{6}+\frac{2}{9}$
9 $\frac{1}{6}+\frac{1}{18}$
10 $\frac{3}{7}+\frac{4}{21}$
11 $\frac{4}{9}+\frac{1}{18}$
12 $\frac{1}{2}+\frac{3}{2}$
13 $\frac{6}{19}+\frac{1}{19}$
14 $\frac{1}{7}+\frac{2}{21}$
15 $\frac{6}{13}+\frac{7}{26}$
16 $\frac{5}{11}+\frac{6}{11}$
17 $\frac{7}{19}+\frac{8}{19}$
18 $\frac{9}{13}+\frac{8}{19}$
19 $\frac{7}{15}+\frac{7}{30}$
20 $\frac{6}{19}+\frac{1}{57}$
21 $\frac{4}{7}+\frac{5}{7}+\frac{6}{7}$
22 $\frac{3}{5}+\frac{4}{5}+\frac{7}{5}$
23 $\frac{7}{13}+\frac{8}{13}+\frac{9}{13}$
24 $\frac{7}{13}+\frac{7}{26}+\frac{7}{39}$
25 $\frac{5}{17}+\frac{5}{34}+\frac{5}{51}$
26 $\frac{6}{19}+\frac{6}{76}+\frac{6}{133}$
27 $\frac{1}{17}+\frac{1}{18}+\frac{1}{19}$
28 $\frac{41}{117}+\frac{16}{117}+\frac{19}{311}$
29 $\frac{213}{741}+\frac{411}{1482}+\frac{16}{6669}$
30 $\frac{11}{173}+\frac{21}{147}+\frac{11}{117}$
31 $\frac{21}{22}+\frac{22}{23}+\frac{23}{24}$
32 $\frac{1}{19}+\frac{2}{19}+\frac{3}{19}+\frac{4}{19}$
33 $\frac{7}{15}+\frac{8}{15}+\frac{9}{15}+\frac{11}{30}$
34 $\frac{6}{13}+\frac{7}{26}+\frac{9}{13}+\frac{1}{104}$
35 $\frac{1}{19}+\frac{1}{21}+\frac{3}{38}+\frac{6}{63}$
36 $\frac{7}{11}+\frac{8}{33}+\frac{6}{11}+\frac{1}{132}$
37 $\frac{1}{111}+\frac{2}{111}+\frac{3}{111}+\frac{4}{111}$
38 $\frac{167}{34}+\frac{168}{51}+\frac{169}{72}+\frac{114}{36}$
39 $\frac{74}{111}+\frac{83}{222}+\frac{1}{333}+\frac{7}{444}$
40 $\frac{6}{123}+\frac{6}{125}+\frac{6}{127}+\frac{6}{129}$

CASE 6.

Subtract the following fractions—

1 $\frac{7}{9}-\frac{4}{9}$
2 $\frac{6}{13}-\frac{1}{13}$
3 $\frac{5}{19}-\frac{2}{19}$
4 $\frac{2}{27}-\frac{1}{54}$
5 $\frac{2}{17}-\frac{1}{34}$
6 $\frac{6}{53}-\frac{1}{53}$
7 $\frac{7}{24}-\frac{1}{48}$
8 $\frac{8}{91}-\frac{2}{91}$
9 $\frac{6}{17}-\frac{3}{34}$
10 $\frac{1}{17}-\frac{1}{18}$
11 $\frac{1}{18}-\frac{1}{19}$
12 $\frac{1}{19}-\frac{1}{20}$
13 $\frac{7}{15}-\frac{1}{16}$
14 $\frac{6}{29}-\frac{2}{17}$
15 $\frac{7}{53}-\frac{1}{54}$
16 $\frac{9}{56}-\frac{1}{14}$
17 $\frac{6}{73}-\frac{1}{70}$
18 $\frac{6}{115}-\frac{2}{317}$
19 $\frac{1}{113}-\frac{1}{114}$
20 $\frac{2}{743}-\frac{1}{1141}$
21 $\frac{4}{23}-\frac{1}{17}$
22 $2\frac{1}{3}-1\frac{1}{7}$
23 $4\frac{2}{17}-1\frac{1}{16}$
24 $6\frac{2}{19}-2\frac{2}{13}$
25 $17\frac{4}{13}-8\frac{1}{19}$
26 $16\frac{1}{3}-12\frac{2}{3}$
27 $9\frac{4}{7}-2\frac{5}{7}$
28 $74\frac{2}{19}-68\frac{5}{19}$
29 $26\frac{1}{18}-7\frac{7}{18}$
30 $4\frac{1}{5}-2\frac{7}{9}$
31 $69\frac{2}{27}-13\frac{1}{29}$
32 $517\frac{1}{3}-\frac{1}{17}$
33 $7\frac{7}{9}-\frac{8}{9}$
34 $16\frac{213}{247}-7\frac{73}{161}$
35 $9\frac{1}{9}-1\frac{7}{8}$
36 $117\frac{11}{13}-29\frac{56}{57}$
37 $7\frac{3}{5}-1\frac{4}{5}$
38 $99\frac{1}{19}-7\frac{5}{33}$
39 $141\frac{7}{17}-16\frac{6}{11}$
40 $473\frac{35}{117}-7\frac{73}{79}$
41 $71\frac{2}{19}-14\frac{3}{19}$
42 $6\frac{1}{15}-2\frac{4}{19}$

CASE 7.

Multiply together the following fractions—

1 $\frac{2}{3} \times \frac{4}{5}$
2 $\frac{2}{7} \times \frac{5}{8}$
3 $\frac{2}{9} \times \frac{2}{7}$
4 $\frac{3}{17} \times \frac{4}{7}$
5 $\frac{11}{19} \times \frac{13}{15}$
6 $\frac{2}{7} \times \frac{3}{5} \times \frac{6}{13}$
7 $\frac{1}{11} \times \frac{3}{19} \times \frac{11}{18}$
8 $3\frac{1}{5} \times 7\frac{1}{6}$
9 $4\frac{2}{7} \times 2\frac{1}{9}$
10 $6\frac{3}{5} \times 7\frac{3}{8}$
11 $9\frac{17}{18} \times 11\frac{4}{17}$
12 $8\frac{1}{4} \times 7\frac{2}{3}$
13 $10\frac{1}{8} \times 7\frac{4}{11}$
14 $7\frac{1}{6} \times 11\frac{2}{9}$
15 $6\frac{1}{5} \times 7\frac{2}{7} \times 9\frac{1}{5}$
16 $14\frac{1}{7} \times 7\frac{2}{3} \times 6\frac{3}{7}$
17 $5\frac{1}{4} \times 6\frac{7}{9} \times 14\frac{4}{5}$
18 $27\frac{7}{8} \times \frac{17}{18} \times 6\frac{1}{9}$
19 $1\frac{11}{19} \times 7\frac{4}{15} \times \frac{14}{27}$
20 $6\frac{2}{3} \times 4\frac{14}{73} \times \frac{26}{27}$
21 $14\frac{1}{9} \times 7\frac{5}{6} \times 69\frac{11}{17}$
22 $26\frac{3}{5} \times \frac{14}{53} \times 7\frac{3}{7}$
23 $6\frac{1}{19} \times \frac{19}{54} \times 7\frac{10}{51}$
24 $\frac{1}{4} \times \frac{2}{3} \times 7\frac{1}{8} \times 17\frac{5}{26}$
25 $\frac{2}{3} \times 7\frac{1}{4} \times \frac{1}{11} \times 24\frac{7}{19}$
26 $7\frac{3}{4} \times \frac{3}{4} \times \frac{1}{16} \times 18\frac{2}{7}$
27 $14\frac{1}{4} \times 7\frac{1}{3} \times 26\frac{9}{20}$
28 $2\frac{7}{15} \times 11\frac{13}{27} \times 7\frac{1}{6}$
29 $19\frac{3}{7} \times 17\frac{7}{31} \times \frac{17}{19}$
30 $\frac{17}{111} \times \frac{24}{112} \times 26\frac{1}{3}$
31 $\frac{6}{157} \times 11\frac{1}{17} \times \frac{1}{13}$
32 $7\frac{3}{13} \times 6\frac{2}{17} \times 7\frac{11}{24}$
33 $\frac{2}{7} \times \frac{7}{12} \times \frac{48}{67} \times \frac{134}{179}$
34 $\frac{7}{11} \times \frac{66}{143} \times 2\frac{114}{342}$
35 $27\frac{2}{7} \times \frac{1}{3} \times 46\frac{7}{24}$
36 $6\frac{11}{17} \times 6\frac{12}{47} \times 6\frac{13}{17}$
37 $17\frac{2}{5} \times 18\frac{7}{19} \times \frac{26}{73}$
38 $2\frac{1}{2} \times 3\frac{1}{4} \times 14\frac{71}{126}$
39 $69\frac{2}{7} \times 141\frac{1}{3} \times \frac{114}{731}$
40 $114\frac{11}{73} \times \frac{1}{19} \times \frac{57}{116}$

CASE 8.

Divide the following fractions—

1 $\frac{2}{3} \div \frac{1}{7}$
2 $\frac{3}{5} \div \frac{4}{7}$
3 $\frac{4}{9} \div \frac{3}{7}$
4 $\frac{5}{7} \div \frac{2}{15}$
5 $\frac{6}{19} \div \frac{7}{24}$
6 $\frac{4}{13} \div \frac{7}{15}$
7 $\frac{1}{11} \div \frac{7}{9}$
8 $\frac{6}{27} \div \frac{27}{199}$
9 $\frac{7}{13} \div \frac{2}{15}$
10 $\frac{11}{24} \div \frac{6}{19}$
11 $2\frac{1}{3} \div 1\frac{7}{15}$
12 $3\frac{2}{7} \div 2\frac{4}{11}$
13 $4\frac{7}{13} \div 1\frac{2}{17}$
14 $9\frac{2}{11} \div 3\frac{2}{7}$
15 $6\frac{1}{17} \div 1\frac{1}{14}$
16 $24\frac{11}{17} \div 3\frac{2}{3}$
17 $74\frac{2}{15} \div \frac{3}{7}$
18 $7\frac{7}{8} \div 2\frac{7}{9}$
19 $126\frac{2}{19} \div 7\frac{4}{5}$
20 $\frac{17}{19} \div \frac{2}{15}$
21 $\frac{19}{57} \div \frac{2}{17}$
22 $\frac{46}{113} \div \frac{7}{19}$
23 $\frac{27}{113} \div \frac{3}{339}$
24 $\frac{16}{111} \div \frac{37}{48}$
25 $\frac{29}{54} \div \frac{87}{162}$
26 $24\frac{1}{3} \div 7\frac{4}{9}$
27 $7\frac{3}{13} \div 1\frac{1}{11}$
28 $9\frac{24}{17} \div 4\frac{2}{7}$
29 $17\frac{4}{17} \div 7\frac{17}{31}$
30 $26\frac{1}{9} \div 2\frac{3}{17}$
31 $114\frac{11}{17} \div 3\frac{15}{16}$
32 $27\frac{2}{19} \div 8\frac{1}{9}$
33 $16\frac{7}{13} \div \frac{27}{84}$
34 $\frac{171}{214} \div \frac{11}{191}$
35 $11\frac{1}{11} \div 7\frac{2}{9}$
36 $47\frac{2}{17} \div 15\frac{11}{49}$
37 $\frac{114}{739} \div \frac{736}{1149}$
38 $14\frac{4}{11} \div \frac{1}{7}$
39 $6\frac{1}{19} \div 1\frac{7}{43}$
40 $1149\frac{1}{17} \div \frac{11}{17}$
41 $9\frac{3}{5} \div 2\frac{1}{17}$
42 $7\frac{1}{16} \div 11\frac{1}{3}$

CASE 9.

Reduce the following compound fractions to their simplest forms—

1 $\frac{2}{3}$ of $\frac{7}{9}$
2 $\frac{3}{5}$ of $\frac{2}{7}$
3 $\frac{3}{7}$ of $\frac{2}{11}$
4 $\frac{7}{16}$ of $\frac{5}{13}$
5 $\frac{4}{11}$ of $\frac{2}{7}$
6 $\frac{3}{4}$ of $\frac{2}{7}$ of $\frac{1}{9}$
7 $\frac{3}{7}$ of $\frac{3}{5}$ of $\frac{2}{9}$
8 $\frac{1}{16}$ of $\frac{3}{17}$ of $\frac{16}{21}$
9 $\frac{52}{196}$ of $\frac{7}{13}$ of $\frac{11}{2}$
10 $\frac{4}{27}$ of $\frac{81}{204}$ of $\frac{26}{113}$
11 $\frac{2}{7}$ of $\frac{7}{18}$ of $\frac{24}{51}$ of $\frac{102}{892}$
12 $\frac{3}{4}$ of $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{6}{7}$
13 $\frac{17}{19}$ of $\frac{38}{51}$ of $\frac{2}{19}$ of $\frac{57}{106}$
14 $\frac{4}{13}$ of $\frac{5}{17}$ of $\frac{26}{35}$ of $\frac{51}{76}$
15 $\frac{2}{17}$ of $\frac{4}{19}$ of $\frac{76}{84}$ of $\frac{85}{124}$
16 $\frac{3}{5}$ of $\frac{7}{8}$ of $\frac{4}{9}$ of $\frac{7}{15}$
17 $\frac{7}{15}$ of $\frac{5}{16}$ of $\frac{19}{27}$ of $\frac{76}{113}$
18 $1\frac{3}{5}$ of $4\frac{3}{5}$ of $7\frac{3}{5}$ of $9\frac{1}{3}$
19 $7\frac{1}{4}$ of $3\frac{7}{9}$ of $5\frac{12}{17}$ of $\frac{27}{3}$
20 $\frac{6}{17}$ of $\frac{68}{72}$ of $1\frac{7}{15}$ of $\frac{17}{59}$
21 $7\frac{4}{9}$ of $5\frac{1}{3}$ of $2\frac{11}{17}$
22 $4\frac{1}{3}$ of $7\frac{1}{9}$ of $17\frac{2}{19}$
23 $11\frac{5}{7}$ of $12\frac{1}{7}$ of $18\frac{1}{3}$
24 $7\frac{5}{7}$ of $29\frac{11}{12}$ of $5\frac{7}{22}$
25 $9\frac{2}{3}$ of $15\frac{7}{18}$ of $\frac{63}{84}$
26 $15\frac{1}{7}$ of $\frac{21}{53}$ of $\frac{477}{1142}$
27 $\frac{3}{7}$ of $\frac{21}{11}$ of $\frac{77}{59}$ of $1\frac{1}{27}$
28 $4\frac{1}{3}$ of $\frac{2}{7}$ of $\frac{3}{14}$ of $7\frac{3}{16}$
29 $6\frac{7}{8}$ of $7\frac{5}{6}$ of $\frac{2}{3}$ of $\frac{1}{19}$
30 $14\frac{1}{8}$ of $27\frac{24}{111}$ of $9\frac{27}{58}$
31 $\frac{7}{15}$ of $\frac{45}{63}$ of $\frac{18}{39}$ of $7\frac{3}{37}$
32 $15\frac{2}{3}$ of $7\frac{1}{15}$ of $11\frac{135}{171}$
33 $\frac{1}{6}$ of $\frac{42}{79}$ of $77\frac{158}{1133}$
34 $\frac{4}{9}$ of $\frac{7}{11}$ of $\frac{2}{11}$ of $\frac{81}{91}$
35 $\frac{51}{79}$ of $1\frac{2}{3}$ of $\frac{237}{459}$ of $7\frac{4}{19}$
36 $56\frac{1}{3}$ of $2\frac{1}{7}$ of $\frac{84}{99}$
37 $7\frac{11}{12}$ of $\frac{1}{4}$ of $12\frac{72}{77}$
38 $64\frac{12}{13}$ of $7\frac{51}{52}$ of $\frac{104}{531}$
39 $4\frac{1}{9}$ of $5\frac{1}{10}$ of $6\frac{2}{3}$
40 $77\frac{3}{17}$ of $\frac{1}{11}$ of $1\frac{133}{134}$

CASE 10.

Reduce the following complex fractions to their simplest forms—

1 $\dfrac{\frac{2}{5}}{\frac{7}{13}}$

2 $\dfrac{\frac{3}{7}}{\frac{5}{6}}$

3 $\dfrac{\frac{1}{9}}{\frac{15}{17}}$

4 $\dfrac{\frac{6}{11}}{\frac{77}{78}}$

5 $\dfrac{\frac{2}{9}}{\frac{15}{27}}$

6 $\dfrac{\frac{4}{13}}{\frac{26}{44}}$

7 $\dfrac{\frac{17}{19}}{\frac{38}{85}}$

8 $\dfrac{\frac{2}{19}}{\frac{76}{104}}$

9 $\dfrac{\frac{7}{15}}{\frac{135}{91}}$

10 $\dfrac{\frac{2}{15}}{\frac{180}{191}}$

11 $\dfrac{7}{2\frac{2}{3}}$

12 $\dfrac{4}{6\frac{1}{3}}$

13 $\dfrac{6}{7\frac{1}{2}}$

14 $\dfrac{10}{11\frac{1}{3}}$

15 $\dfrac{7}{15\frac{1}{8}}$

16 $\dfrac{14}{15\frac{1}{7}}$

17 $\dfrac{7\frac{1}{3}}{8}$

18 $\dfrac{12\frac{3}{4}}{13}$

19 $\dfrac{17\frac{3}{15}}{41}$

20 $\dfrac{4\frac{11}{13}}{15}$

21 $\dfrac{17\frac{1}{3}}{19\frac{3}{7}}$

22 $\dfrac{4\frac{7}{8}}{5\frac{3}{11}}$

23 $\dfrac{17\frac{1}{3}}{54\frac{3}{7}}$ of $\dfrac{4\frac{1}{9}}{15\frac{7}{13}}$

24 $\dfrac{6\frac{4}{9}}{17\frac{3}{11}}$ of $\dfrac{4\frac{1}{3}}{5\frac{7}{19}}$

25 $\dfrac{7\frac{3}{15}}{8\frac{1}{3}}$ of $\dfrac{44\frac{3}{7}}{161\frac{1}{3}}$

26 $\dfrac{3\frac{1}{3}}{7\frac{1}{9}}$ of $\dfrac{6\frac{33}{34}}{13\frac{11}{17}}$

27 $\dfrac{7\frac{1}{9}}{17\frac{7}{24}}$ of $\dfrac{4\frac{2}{15}}{5\frac{1}{9}}$

28 $\dfrac{14\frac{2}{3}}{71\frac{1}{6}}$ of $\dfrac{2\frac{7}{8}}{4\frac{8}{15}}$

29 $\dfrac{7\frac{7}{51}}{24\frac{1}{7}}$ of $\dfrac{11\frac{2}{3}}{7\frac{7}{82}}$

30 $\dfrac{26\frac{5}{12}}{27\frac{8}{11}}$ of $\dfrac{11\frac{2}{9}}{27\frac{3}{26}}$

31 $\dfrac{\frac{72}{147}}{\frac{18}{25}}$ of $\dfrac{19\frac{9}{15}}{\frac{960}{31}}$ of $\dfrac{223\frac{5}{13}}{216}$ of $\dfrac{48}{33}$ of $\dfrac{216}{19\frac{9}{15}}$.

32 $\dfrac{\frac{47}{57}}{\frac{112}{141}}$ of $\dfrac{17\frac{3}{8}}{52\frac{1}{8}}$ of $\dfrac{43\frac{7}{15}}{21\frac{11}{15}}$ of $\dfrac{\frac{79}{158}}{7\frac{1}{3}}$ of $\dfrac{104\frac{1}{4}}{52\frac{1}{8}}$.

33 $\dfrac{1\frac{1}{3}}{6\frac{5}{7}}$ of $\dfrac{2\frac{5}{6}}{11\frac{1}{3}}$ of $\dfrac{7}{6\frac{1}{3}+\frac{7}{6}}$ of $\dfrac{9\frac{1}{3}}{28}$.

34 $\dfrac{3\frac{1}{7}}{7\frac{1}{5}}$ of $\dfrac{5\frac{2}{3}}{7\frac{1}{9}}$ of $\dfrac{7\frac{1}{6}}{27\frac{7}{9}}$ of $\dfrac{1}{33\frac{1}{3}+\dfrac{1}{4\frac{1}{4}}}$ of $\dfrac{27\frac{7}{9}}{17}$.

35 $\dfrac{17\frac{3}{5}}{119\frac{1}{3}}$ of $\dfrac{5\frac{1}{6}}{9\frac{1}{18}}$ of $\dfrac{7\frac{2}{3}}{14\frac{1}{7}}$ of $\dfrac{18\frac{3}{4}}{22\frac{1}{5}}$ of $\dfrac{18\frac{1}{9}}{20\frac{2}{3}}$.

36 $\dfrac{7\frac{1}{3}}{5\frac{2}{9}}$ of $\dfrac{2\frac{1}{3}}{4\frac{1}{7}}$ of $\dfrac{1\frac{1}{3}}{4\frac{1}{9}}$ of $\dfrac{119\frac{5}{13}}{95\frac{1}{3}}$ of $\dfrac{7\frac{1}{5}}{50\frac{2}{5}}$

37 $\dfrac{4\frac{1}{9}}{17\frac{3}{5}}$ of $\dfrac{7\frac{1}{2}}{19\frac{3}{7}}$ of $\dfrac{7\frac{1}{5}}{9\frac{2}{3}}$ of $\dfrac{2\frac{1}{9}}{7\frac{1}{5}}$ of $\dfrac{35\frac{1}{5}}{15}$.

38 $\dfrac{7\frac{1}{3}}{19\frac{1}{4}}$ of $\dfrac{14\frac{2}{3}}{19\frac{1}{5}}$ of $\dfrac{7}{11\frac{1}{3}}$ of $\dfrac{1\frac{1}{10}}{9\frac{4}{7}}$ of $\dfrac{38\frac{1}{2}}{29\frac{1}{3}}$.

CASE 11.

Reduce the following compound fractional expressions to their simplest forms—

1 $\frac{1}{4}$ of $\frac{7}{9}\times2\frac{2}{3}$

2 $\frac{1}{3}$ of $\frac{4}{5}\times1\frac{1}{9}$

3 $\frac{4}{7}$ of $7\frac{1}{9}\times7\frac{6}{13}$

4 $(\frac{3}{5}$ of $6\frac{2}{9})\div5\frac{3}{5}$

5 $(\frac{2}{3}$ of $9\frac{1}{5})\div1\frac{3}{7}$

6 $(1\frac{1}{3}\times4\frac{2}{3})\div1\frac{3}{7}$

7 $(9\frac{1}{6}+4\frac{1}{7})\div3\frac{1}{3}$

8 $(7\frac{4}{11}-4\frac{1}{3})\div4\frac{2}{13}$

9 $14\frac{2}{7}+7\frac{3}{6}-4\frac{1}{8}$

10 $9\frac{3}{5}+8\frac{1}{4}-7\frac{6}{13}$

11 $7\frac{4}{11}-4\frac{7}{11}+6\frac{10}{11}$

12 $4\frac{2}{7}$ of $\frac{2}{13}$ of $9\frac{1}{11}$

13 $6\frac{3}{10}-4\frac{1}{7}+1\frac{1}{14}$

14 $12\frac{3}{7}\times\dfrac{7}{11\frac{1}{3}}\times\dfrac{9}{7\frac{4}{9}}$

15 $7\frac{4}{5}\div(9\frac{1}{3}-6\frac{1}{11})$

16 $(14\frac{3}{7}+6\frac{1}{9})\div4\frac{1}{3}$

17 $\dfrac{\frac{1}{3}\text{ of }\frac{3}{7}}{\frac{2}{3}\text{ of }\frac{4}{7}}\times\dfrac{6\frac{1}{2}}{\frac{4}{5}+\frac{1}{3}}$

18 $\dfrac{6\frac{2}{3}+4\frac{1}{7}}{4\frac{1}{9}-2\frac{3}{5}}\times\dfrac{5\frac{1}{3}-2\frac{7}{9}}{5\frac{1}{3}+2\frac{7}{9}}$

19 $\dfrac{7\frac{5}{6}\text{ of }4\frac{1}{3}}{4\frac{1}{9}\text{ of }1\frac{1}{7}}\div\dfrac{6\frac{1}{3}}{3\frac{1}{3}-1\frac{1}{7}}$

20 $\dfrac{4\frac{3}{7}\text{ of }2\frac{1}{6}}{9\frac{1}{2}}\div\dfrac{\frac{2}{3}+\frac{1}{4}}{7\frac{1}{9}-6\frac{1}{3}}$

21 $\dfrac{6\frac{1}{3}\div7\frac{1}{3}}{2\frac{2}{3}-1\frac{1}{9}}\div\dfrac{9\frac{1}{5}-1\frac{1}{7}}{4\frac{2}{3}+2\frac{1}{6}}$

22 $\dfrac{\frac{2}{3}\text{ of }\frac{1}{7}}{\frac{4}{11}\text{ of }\frac{1}{9}}+\dfrac{\frac{1}{6}\text{ of }2\frac{1}{2}}{\frac{1}{7}\text{ of }3\frac{3}{5}}$

23 $\dfrac{\frac{4}{5}\text{ of }\frac{2}{9}}{\frac{2}{7}\text{ of }\frac{1}{3}}+\dfrac{2\frac{1}{2}\text{ of }\frac{1}{3}}{7\frac{1}{2}\text{ of }11\frac{1}{6}}$

24 $$\frac{7\frac{1}{3}}{11\frac{1}{8}}+\frac{9\frac{1}{3}}{15\frac{2}{7}}$$

25 $$\frac{3\frac{1}{7}\text{ of }4\frac{1}{9}}{4\frac{1}{6}\text{ of }7\frac{1}{11}}-\frac{2\frac{2}{3}\text{ of }9\frac{1}{4}}{4\frac{1}{6}\text{ of }11\frac{1}{7}}$$

26 $$\frac{1\frac{1}{9}\text{ of }4\frac{2}{7}}{9\frac{2}{7}\text{ of }11\frac{1}{2}}-\frac{6\frac{3}{7}\text{ of }7\frac{7}{15}}{11\frac{2}{3}\text{ of }4\frac{2}{13}}$$

27 $$\frac{8\frac{1}{3}\text{ of }7\frac{7}{19}}{11\frac{2}{3}\text{ of }7\frac{3}{8}}-\frac{8\frac{1}{3}\text{ of }7\frac{1}{9}}{4\frac{1}{4}\text{ of }7\frac{4}{15}}$$

28 $(\frac{3}{4}-\frac{1}{6})\times(\frac{4}{7}+\frac{2}{9})$

29 $(\frac{1}{11}+\frac{4}{7})\div(\frac{2}{3}-\frac{1}{11})$

30 $(7\frac{1}{5}-2\frac{1}{6})+(7\frac{2}{9}\times\frac{1}{3}\times\frac{1}{16})$

31 $(4\frac{2}{7}+7\frac{1}{9}-\frac{2}{11})\times(4\frac{2}{11}-\frac{3}{22}+7\frac{3}{44})\times(2\frac{1}{3}+1\frac{1}{7})$

32 $(6\frac{3}{11}-2\frac{1}{7}+1\frac{7}{13})\div(9\frac{1}{6}+2\frac{2}{3}-1\frac{7}{9})$

33 $(\frac{2}{3}-\frac{9}{21})\times(7\frac{1}{3}-5\frac{2}{7})\div(9\frac{1}{3}+7\frac{1}{16}-14\frac{2}{11})$

34 $(1\frac{1}{9}+7\frac{3}{5}-2\frac{2}{19})\div(7\frac{4}{13}-2\frac{2}{13}+6\frac{1}{26})$

35 $$3\frac{1}{7}+\frac{11}{4\frac{1}{3}+7\frac{1}{4}}\times\frac{2\frac{1}{7}+1\frac{4}{9}}{9\frac{1}{3}-8\frac{7}{15}}\times\frac{7\frac{1}{2}}{3\frac{1}{5}+1\frac{1}{7}}.$$

36 $$\frac{\frac{7}{15}-\frac{1}{13}+\frac{2}{27}}{\frac{5}{16}+\frac{3}{14}-\frac{2}{19}}\times\frac{7\frac{3}{5}+5\frac{4}{9}-9\frac{3}{7}}{6\frac{2}{3}-1\frac{1}{7}+8\frac{1}{4}}\times\frac{2\frac{1}{3}}{7\frac{1}{11}}.$$

CASE 12.

Express in positive terms the value of the following fractions—

1 $\frac{7}{30}$ of a £.
2 $\frac{9}{20}$ of a £.
3 $\frac{4}{30}$ of a £.
4 $\frac{3}{40}$ of a £.
5 $\frac{2}{7}$ of a guinea.
6 $\frac{4}{21}$ of a guinea.
7 $\frac{5}{30}$ of half-a-crown.
8 $\frac{2}{9}$ of half-a-crown.
9 $\frac{3}{7}$ of half-a-guinea.
10 $\frac{3}{8}$ of a shilling.
11 $\frac{1}{8}$ of a florin.
12 $\frac{3}{4}$ of a florin.
13 $\frac{5}{7}$ of a mile.
14 $\frac{3}{19}$ of a French ell.
15 $\frac{4}{7}$ of a cubic foot.
16 $\frac{7}{15}$ of an ounce troy.
17 $\frac{75}{240}$ of a £.
18 $\frac{5}{7}$ of a hhd. of wine.
19 $\frac{6}{27}$ of a hhd. of ale.
20 $\frac{3}{10}$ of a florin.
21 $\frac{16}{17}$ of a guinea.
22 $\frac{4}{27}$ of a cubic yard.
23 $\frac{1}{13}$ of a qr. of wheat.
24 $\frac{7}{16}$ of a ton.
25 $\frac{2}{3}\frac{1}{2}$ of a £.
26 $\frac{1}{2}\frac{2}{1}$ of half-a-guinea.
27 $\frac{7}{43}$ of a mile.
28 $\frac{4}{29}$ of an acre.

29 $\frac{1}{3}$ of a groat.
30 $\frac{5}{19}$ of a year.
31 $\frac{11}{24}$ of a £.
32 $\frac{1}{37}$ of a guinea.
33 $\frac{24}{25}$ of a florin.
34 $\frac{7}{8}$ of a ton.
35 $\frac{6}{17}$ of a crown.
36 $\frac{3}{50}$ of five pounds.
37 $\frac{7}{19}$ of five guineas.
38 $\frac{11}{12}$ of a chaldron.
39 $\frac{23}{27}$ of ten pounds.
40 $\frac{17}{18}$ of one guinea.

CASE 13.

To reduce money, weights, &c., into fractions—

	Express	*in terms of*
1	7d.	a shilling.
2	9d.	a shilling.
3	10d.	a £.
4	15d.	a £.
5	$14\frac{1}{2}$d.	a £.
6	1s. 7d.	a £.
7	2s. $4\frac{1}{3}$d.	a £.
8	3s. $5\frac{3}{4}$d.	a £.
9	4s. $7\frac{1}{3}$d.	a £.
10	5s. $6\frac{1}{5}$d.	a £.
11	7s. $5\frac{3}{7}$d.	a £.
12	9s. $4\frac{2}{9}$d.	a £.
13	11s. $5\frac{3}{17}$d.	a £.
14	17s. $4\frac{11}{12}$d.	a £.
15	4s. $4\frac{3}{5}$d.	a guinea.
16	19s. $7\frac{3}{5}$d.	a guinea.
17	14s. $5\frac{2}{11}$d.	a guinea.
18	2s. $4\frac{1}{3}$d.	half-a-guinea.
19	1s. $7\frac{3}{5}$d.	half-a-crown.
20	4s. $11\frac{2}{3}$d.	a £.
21	11 lbs. 3 oz. 3 drs.	a cwt.
22	17 lbs. 1 oz. 11 drs.	a cwt.
23	17 lbs. $1\frac{1}{3}$ oz.	a ton.
24	2 yds. $2\frac{1}{3}$ qrs.	an E. ell.
25	1 st. 3 lbs.	a cwt.
26	2 hrs. $2\frac{1}{7}$ min.	a day.
27	4 fur. 17 p. 2 yds.	a mile.
28	2 r. 17 p.	an acre.
29	3 r. $37\frac{3}{7}$ p.	an acre.
30	7 oz. 13 dwt. $2\frac{2}{3}$ gr.	a lb.
31	8 oz. 8 dwt. $2\frac{1}{17}$ gr.	a lb.
32	4 oz. $15\frac{3}{7}$ dwt.	a lb.
33	7 lbs. 14 oz. 14 dr.	a cwt.
34	2 lbs. 11 oz. $7\frac{1}{7}$ dr.	a ton.
35	2 ft. 7 in. $1\frac{2}{7}$ b.c.	a yard.
36	2 ft. 9 in. $2\frac{4}{5}$ b.c.	a mile.
37	15 lbs. $12\frac{3}{7}$ oz.	a ton.
38	17 lbs. 3 oz. $13\frac{5}{6}$ dr.	a cwt.
39	7s. $6\frac{3}{5}$d.	a £.
40	17s. $5\frac{3}{7}$d.	a guinea.

CASE 14.

To reduce fractions of one denomination to the fraction of another retaining the same value.

1 Reduce $\frac{3}{8}$ of a £ to the fraction of a shilling.
2 Reduce $\frac{1}{8}$ of a £ to the fraction of a penny.
3 Reduce $\frac{2}{7}$ of a guinea to the fraction of a farthing.
4 Reduce $\frac{1}{3}$ of a farthing to the fraction of a £.
5 Reduce $\frac{2}{7}$ of a penny to the fraction of a florin.

6 Reduce $\frac{7}{19}$ of a guinea to the fraction of a penny.
7 Reduce $\frac{1}{3}$ of a florin to the fraction of a farthing.
8 Reduce $\frac{1}{3}$ of a florin to the fraction of a penny.
9 Reduce $\frac{1}{3}$ of a florin to the fraction of a shilling.
10 Reduce $\frac{1}{3}$ of a florin to the fraction of half-a-sovereign.
11 Reduce $\frac{1}{3}$ of a florin to the fraction of a £.
12 Reduce $\frac{1}{30}$ of a pound troy to the fraction of a grain.
13 Reduce $\frac{7}{9}$ of a grain to the fraction of a pound troy.
14 Reduce $\frac{3}{15}$ of an English ell to the fraction of a yard.
15 Reduce $\frac{4}{7}$ of a yard to the fraction of an English ell.
16 Reduce $\frac{73}{74}$ of a square yard to the fraction of an acre.
17 Reduce $\frac{3}{5}$ of a shilling to the fraction of a crown.
18 Reduce $\frac{1}{12}$ of a crown to the fraction of a penny.
19 Reduce $\frac{2}{13}$ of a cubic yard to the fraction of an inch.
20 Reduce $\frac{2}{75}$ of a guinea to the fraction of a penny.

CASE 15.

Express in positive terms the value of the following quantities—

1 $\frac{2}{3}$ of a sovereign, + $\frac{1}{8}$ of a florin.
2 $\frac{1}{7}$ of two guineas, — $\frac{1}{8}$ of two shillings.
3 $\frac{3}{5}$ of a crown, + $\frac{7}{8}$ of a sovereign.
4 $\frac{1}{12}$ of three guineas, + $\frac{5}{8}$ of 13s. 4d.
5 $\frac{7}{8}$ of half a sovereign, — $\frac{3}{4}$ of a groat.
6 $\frac{9}{10}$ of a sovereign, — $\frac{9}{10}$ of a crown.
7 $\frac{1}{3}$ of a guinea, + $\frac{1}{7}$ of a pound, — $\frac{3}{4}$ of a crown.
8 $\frac{5}{7}$ of two guineas, — $\frac{1}{3}$ of a pound, + $\frac{9}{10}$ of a shilling.
9 $\frac{3}{7}$ of four guineas, — $\frac{3}{7}$ of a pound, + $\frac{3}{7}$ of a shilling.
10 $\frac{6}{7}$ of a guinea, + $\frac{7}{12}$ of a shilling, — $\frac{1}{3}$ of a florin.
11 $\frac{3}{7}$ of half-a-guinea, — $\frac{1}{8}$ of two shillings, + $\frac{7}{8}$ of a pound.
12 $\frac{5}{6}$ of a crown, + $\frac{5}{6}$ of a shilling, + $\frac{5}{8}$ of threepence.
13 $\frac{7}{10}$ of a pound, + $\frac{7}{10}$ of half-a-guinea, — $\frac{1}{3}$ of a crown.
14 $\frac{9}{10}$ of three guineas, + $\frac{1}{3}$ of a sovereign, — $\frac{1}{3}$ of a shilling.
15 $\frac{3}{4}$ of an ounce, + $\frac{1}{3}$ of a ton, + $\frac{1}{6}$ of a cwt.
16 $\frac{7}{8}$ of a ton, + $\frac{1}{5}$ of a cwt, — $\frac{1}{3}$ of an ounce.
17 $\frac{2}{3}$ of an acre, + $\frac{3}{4}$ of a rood, + $\frac{7}{10}$ of a perch.
18 $\frac{7}{8}$ of a dwt., + $\frac{1}{12}$ of an ounce, + $\frac{7}{12}$ of a pound.
19 $\frac{6}{7}$ of a pound, + $\frac{1}{5}$ of an ounce, — $\frac{1}{3}$ of a dwt.
20 $\frac{2}{3}$ of a mile, + $\frac{1}{180}$ of a mile, + $\frac{1}{18}$ of a league.
21 $\frac{4}{5}$ of a lb., + $\frac{4}{7}$ of an ounce, + $\frac{3}{10}$ of a ton.
22 $\frac{6}{7}$ of a hhd., + $\frac{1}{3}$ of a gallon, + $\frac{3}{4}$ of a pint.
23 $\frac{3}{4}$ of a day, + $\frac{7}{8}$ of a minute, + $\frac{11}{14}$ of a week.

24 £174. 17s. $6\frac{3}{4}$d., $\times(7\frac{2}{3}+5\frac{1}{7}-1\frac{1}{3})$.
25 £186. 19s. $4\frac{1}{5}$d., $\times(8\frac{1}{5}-7\frac{1}{6}+9\frac{1}{10})$.
26 £142. 17s. $7\frac{3}{5}$d., $\times(46\frac{7}{8}\div7\frac{5}{6})$.
27 £114. 12s. $4\frac{1}{9}$d.. $\times(57\frac{1}{12}+6\frac{5}{12})$
28 £186. 14s. $7\frac{3}{10}$d., $\times(69\frac{3}{7}-7\frac{4}{7})$
29 £149. 7s. $10\frac{3}{7}$d., $\times(113\frac{1}{12}+1\frac{1}{12})$.
30 £181. 7s. $4\frac{3}{8}$d., $\times(112\frac{7}{15}\div\frac{7}{9}^{3})$.
31 £1114. 9s. $10\frac{3}{11}$d., $\times119\frac{1}{14}$.
32 7 lb. 4 oz. 17 dwts. $16\frac{1}{5}$ grs., $\div7\frac{3}{7}$.
33 11 tons 11 cwt. 1 qr. $17\frac{3}{7}$ lbs., $\div9\frac{3}{5}$.
34 £94. 17s. $6\frac{3}{5}$d., $\div11\frac{3}{10}$.
35 £146. 14s. $11\frac{4}{11}$d., $\div17\frac{5}{6}$.
36 71 days 19 hrs. 43 min. $17\frac{1}{11}$ sec., $\div19\frac{5}{7}$.
37 2 tons 2 qrs. $17\frac{1}{7}$ oz., $\times11\frac{9}{10}$.
38 £639. 12s. $7\frac{4}{9}$d., $\times29\frac{4}{11}$.
39 £639. 13s. $10\frac{4}{5}$d., $\div117\frac{3}{14}$.
40 £1137. 19s. $4\frac{2}{7}$d., $\div111\frac{3}{7}$.
41 £1417. 16s. $10\frac{1}{13}$d. $\times(7\frac{1}{3}+5\frac{1}{9})$
42 1146 years 7 months 14 days $17\frac{1}{9}$ hours $\div$ $9\frac{1}{6}$.

RULE OF THREE IN FRACTIONS.

1 How many yards of silk may be bought for £173. 17s. 6d., if $3\frac{1}{7}$ yards cost £1. 7s. $5\frac{1}{3}$d ?
2 How many English ells of silk may be bought for £217. 7s. $1\frac{1}{5}$d., if $4\frac{1}{9}$ yards cost £1. 17s. $7\frac{1}{12}$d.?
3 If $7\frac{1}{7}$ pieces of cloth, each $21\frac{3}{8}$ yards, cost £96. 7s. $5\frac{1}{4}$d., what will $3\frac{1}{3}$ yards cost?
4 If $14\frac{1}{12}$ pieces, each $19\frac{1}{3}$ yards, cost £101. 19s. $4\frac{1}{3}$d., and 16s. $4\frac{1}{7}$d. be paid for carriage, what will $7\frac{1}{5}$ yards cost at that rate?
5 A grocer bought $5\frac{1}{3}$ chests of tea, each weighing 2 qrs. $17\frac{1}{5}$ lbs., at 3s. $7\frac{1}{8}$d. per lb: how should he sell it per cwt. to clear £3. 0s. $6\frac{1}{3}$d. by the sale?
6 A grocer sold 1 cwt. 1 qr. $11\frac{7}{9}$ lbs. of coffee for £6. 17s. $4\frac{6}{7}$d., and lost 17s. $4\frac{2}{7}$d. by the sale; how did he buy it per lb?
7 Bought $146\frac{1}{9}$ yards of cloth for £$73\frac{1}{16}$; how must it be sold per Eng. ell to gain £$1\frac{1}{12}$. by the sale?

8 Find the value of $14\frac{1}{7}$ pieces of silk, each measuring $43\frac{3}{5}$ yards, at £7. 2s. 6d. for $12\frac{5}{17}$ yards?

9 Find the value of $15\frac{3}{8}$ casks of sugar, each 3 cwt. 1 qr. $17\frac{3}{5}$ lbs. at £$2\frac{4}{7}$ per cwt.

10 How much sugar can be bought for £$307\frac{1}{9}$, if 1 cwt. 3 qrs. $13\frac{3}{5}$lbs. cost £4. 7s. $3\frac{1}{3}$d.?

11 Bought 173 Eng. ells 4 qrs. $2\frac{1}{3}$ nls. of cloth for £53. $7\frac{3}{7}$s., and sold it at a profit of £5. 3s. $7\frac{1}{7}$d.; how did I sell it per yard?

12 Bought 247 Eng. ells 1 qr. $3\frac{1}{5}$ nls. for £81. 17s. $4\frac{1}{3}$d., and sold it at a loss of £6. $7\frac{1}{9}$s.; how was it sold per yard?

13 A silver tankard cost £7. 5s. $6\frac{1}{5}$d., at 7s. $4\frac{1}{7}$d. per ounce; what was its weight?

14 A grocer bought 17 cwt. 1 qr. $17\frac{3}{5}$ lb. of sugar for £45. 17s. $10\frac{1}{9}$d.; he paid £1. 4s. $6\frac{1}{3}$d. for expenses, how must he sell it per lb. to clear £8. 1s. $4\frac{2}{5}$d. by the transaction?

15 A grocer bought 19 cwts. 2 qrs. $11\frac{3}{8}$ lbs. of sugar for £54. 7s. $5\frac{1}{6}$d.; he paid 19s. for carriage, &c., and found at the close of the sale that he had lost £3. 7s. $3\frac{1}{9}$d. by the whole; how did he sell it per lb.?

16 Bought $3\frac{1}{2}$ pieces of silk, each measuring $24\frac{3}{7}$ yards, for 6s. $0\frac{3}{5}$d. per Eng. ell; what must one yard be sold for to clear £3. 4s. $9\frac{3}{10}$d. by the purchase?

17 A grocer bought three chests of tea, one weighing 1 qr. $11\frac{1}{7}$ lbs.; the second, 2 qrs. $19\frac{1}{8}$ lbs.; and the third, 1 qr. $27\frac{1}{10}$ lbs., for £26. 18s. $10\frac{3}{5}$d., and sold it to clear $8\frac{13}{15}$d. per lb.; what was the selling price per lb?

18 Find the value of 3 casks of raisins, each weighing 1 cwt. 1 qr. $17\frac{3}{5}$ lbs., at $5\frac{1}{6}$d. per lb.

19 From a quantity of coffee weighing 7 cwt. 1 qr. $11\frac{3}{7}$ lbs. a dealer sold at one time 1 cwt. 2 qrs. $24\frac{3}{19}$ lbs., at another, 1 cwt. 1 qr. $17\frac{3}{5}$ lbs., and at another, 2 cwt. 0 qrs. $12\frac{2}{15}$ lbs., find the value of the remainder at 1s. $4\frac{1}{9}$d. per lb.

20 How many currants could be bought for £171. 17s. $4\frac{1}{9}$d., if 3 cwt. 1 qr. $1\frac{1}{7}$ lb. cost £7. 14s. $1\frac{1}{3}$d.?

DECIMAL FRACTIONS.

CASE 1.

Express the following vulgar fractions in a decimal form—

1	$\frac{1}{2}$	11	$\frac{1}{2}$	21	$5\frac{1}{4}$	31	$\frac{1}{2}$ of $\frac{3}{5}$
2	$\frac{2}{4}$	12	$\frac{3}{16}$	22	$7\frac{1}{2}$	32	$\frac{2}{5}$ of $\frac{7}{8}$
3	$\frac{3}{4}$	13	$\frac{5}{16}$	23	$9\frac{3}{5}$	33	$\frac{1}{4}$ of $\frac{7}{10}$
4	$\frac{1}{8}$	14	$\frac{7}{16}$	24	$2\frac{3}{8}$	34	$\frac{3}{8}$ of $\frac{9}{20}$
5	$\frac{2}{8}$	15	$\frac{7}{50}$	25	$11\frac{1}{8}$	35	$1\frac{1}{5}$ of $7\frac{3}{15}$
6	$\frac{3}{8}$	16	$\frac{23}{64}$	26	$7\frac{2}{5}$	36	$4\frac{1}{3}$ of $\frac{2}{5}$
7	$\frac{4}{8}$	17	$\frac{11}{64}$	27	$5\frac{1}{10}$	37	$6\frac{2}{15}$ of $\frac{1}{40}$
8	$\frac{5}{8}$	18	$\frac{5}{32}$	28	$6\frac{3}{4}$	38	$11\frac{4}{15}$ of $\frac{9}{50}$
9	$\frac{6}{8}$	19	$\frac{28}{3125}$	29	$15\frac{27}{32}$	39	$2\frac{1}{16}$ of $\frac{17}{100}$
10	$\frac{7}{8}$	20	$\frac{144}{625}$	30	$64\frac{1}{20}$	40	$4\frac{2}{15}$ of $1\frac{1}{8}$

CASE 2.

Convert the following decimals into their equivalent vulgar fractions—

1	·5	12	·0168	23	·001	34	1496·2
2	·05	13	·7072	24	·0001	35	6·705
3	·25	14	·075	25	·00001	36	94·002
4	·025	15	2·05	26	·000001	37	1869·7
5	·125	16	71·508	27	·10	38	41·146
6	·0125	17	4·009	28	·100	39	8·10005
7	·8	18	48·16	29	·1000	40	4789·74
8	·88	19	942·75	30	·10000	41	·640085
9	·08	20	1·0002	31	·100000	42	·0008455
10	·68	21	·1	32	8·003125	43	2·095
11	·168	22	·01	33	97·015	44	646·05

CASE 3.

Express the following fractions, which do not terminate in a decimal form—

1	$\frac{1}{3}$	12	$\frac{1}{7}$	23	$4\frac{1}{11}$	34	$241\frac{71}{999}$
2	$\frac{2}{3}$	13	$\frac{3}{28}$	24	$7\frac{2}{17}$	35	$16\frac{7}{99}$
3	$\frac{13}{9}$	14	$\frac{4}{999}$	25	$6\frac{5}{17}$	36	$124\frac{1}{17}$
4	$\frac{1}{9}$	15	$7\frac{3}{7}$	26	$4\frac{9}{28}$	37	$6\frac{4}{77}$
5	$\frac{11}{9}$	16	$19\frac{2}{9}$	27	$11\frac{1}{13}$	38	$745\frac{3}{13}$
6	$\frac{11}{12}$	17	$11\frac{5}{6}$	28	$64\frac{2}{3}$	39	$17\frac{54}{972}$
7	$\frac{2}{7}$	18	$10\frac{1}{90}$	29	$96\frac{27}{486}$	40	$5674\frac{5}{48}$
8	$\frac{11}{7}$	19	$3\frac{1}{70}$	30	$11\frac{1}{28}$	41	$94\frac{39}{66}$
9	$\frac{35}{9}$	20	$147\frac{1}{3}$	31	$104\frac{370}{518}$	42	$1746\frac{15}{28}$
10	$\frac{1}{137}$	21	$6\frac{1}{28}$	32	$7\frac{13}{22}$	43	$73\frac{2}{7}$
11	$\frac{2}{35}$	22	$9\frac{6}{7}$	33	$1\frac{1}{48}$	44	$116\frac{713}{999}$

CASE 4.

Convert the following circulating decimals into their equivalent vulgar fractions—

1 $\cdot\dot{8}7\dot{6}$
2 $\cdot\dot{5}\dot{7}$
3 $\cdot\dot{3}\dot{6}$
4 $\cdot\dot{6}3\dot{9}$
5 $\cdot\dot{2}\dot{7}$
6 $\cdot\dot{3}3\dot{3}$
7 $\cdot011\dot{3}\dot{6}$
8 $\cdot128\dot{8}$
9 $\cdot\dot{8}5714\dot{2}$
10 $\cdot40\dot{6}$
11 $\cdot0\dot{4}3\dot{2}$
12 $\cdot6080\dot{6}$
13 $\cdot6559\dot{9}0\dot{3}$
14 $\cdot01234567\dot{9}$
15 $\cdot12931\dot{3}\dot{1}$
16 $19\cdot\dot{0}1\dot{2}$
17 $3\cdot98\dot{7}\dot{5}$
18 $4\cdot6\dot{4}2857\dot{1}$
19 $124\cdot3\dot{7}\dot{8}$
20 $4\cdot4\dot{5}2380\dot{9}$
21 $6\cdot1\dot{1}5384\dot{6}$
22 $10\cdot09\dot{6}1538\dot{4}$
23 $7\cdot083\dot{3}$
24 $10\cdot\dot{7}1428\dot{5}$
25 $114\cdot0\dot{5}$
26 $\cdot3809\dot{4}2857\dot{1}$
27 $47\cdot457\dot{4}5\dot{7}$
28 $112\cdot37\dot{5}9\dot{2}$
29 $12\cdot000220\dot{9}\dot{5}$
30 $21\cdot1375\dot{9}\dot{2}$

CASE 5.

Add together the following decimals—

1 73+7·3+·073+5·073+942.
2 ·049+74·142+9·417+·00147
3 4·27+·274+·2047+7+7497+·009.
4 ·005+73+·073+914+·04+·91417.
5 71+·71+7·1+·071+710+·0371+7100.
6 42369+42·369+·42369+4236·9+4·2369.
7 ·0009+·000009+9+90+·09+1·0009.
8 46+2·46+12·46+·00046+9+142·6
9 123·4+1·234+1234+1·234+12·34+·01234
10 926·4+1·749+·094+940+7+·0007.

11 ·004+·04+·4+4+·40+947+·097.
12 74287+7489·7+7·4987+·007497.
13 12·345+12345+·12345+123·45.
14 74+·0129+4+·009+49+498·7.
15 24·74+2·472+24749+·00009.
16 46+·246+2·1479+·001+104·2.
17 947·8+9·109+·10407+9+·009.
18 ·42604+4264+2·0417+·04+40.
19 1417+90·1+·00927+917+·9174.
20 ·643+6·43+64·3+643+·000643.

CASE 6.

Subtract the following decimals.

1 ·742—·0049
2 ·12—·1112
3 74·16—·7416
4 ·2412—·04731
5 8·6414—·049
6 ·9107—·14217
7 426·1—·4261
8 42·61—4·2261
9 4261—·4261
10 ·81426—·047191
11 1·42—·198476
12 7·141—·09819
13 649·1—·64876
14 8·14—·0799
15 814—·814
16 742—74·2
17 4—·0019
18 1·428—·95979
19 614·7—·75
20 2·09—·209
21 4736—·09891
22 2163—1·473
23 6·82412—·4127
24 1418·9—·204
25 2·101—·98765
26 43·17—1·234
27 6·487—·6487
28 8·942—·0089
29 42·7—8·7426
30 147·3—18·923

CASE 7.

Multiply together the following decimals

1 4·27×2·009
2 2·176×·8004
3 734·6×42·9
4 1·4213×·09
5 684·7×4·23
6 ·009×·09
7 4236×·749
8 2·48×·049
9 9143×·0147
10 ·4736×4736
11 ·0429×43
12 641×·00004
13 2·141×·041
14 438×·2417
15 ·0009×·0004
16 ·04×·04×·04
17 ·004×·004×·004
18 6·14×·417×·09
19 426×·204×41·7
20 1·234×247×·009

21 61·42×·009×·04
22 84×·8004×·0819
23 ·09×9×·00017
24 ·7×64867×·64867
25 214·7×·01×·023
26 40·89×408·9×·4089
27 608×·608×·00608
28 8·14×·001×829·7
29 ·423×·0423×423
30 600·9×·006×·009

CASE 8.

Divide the following decimals—

1 74·26÷71·49
2 841·7÷·009
3 ·413÷842·6
4 ·1234÷3·474
5 4271÷·0247
6 14·171÷42·63
7 ·0009÷814
8 2476÷247·6
9 709÷7·091
10 ·709÷·7091
11 ·0001÷457
12 942·6÷6847
13 10·814÷·0149
14 ·541÷5418
15 ·0143÷·0719
16 6487÷·0047
17 ·6487÷·0047
18 648·7÷·0047
19 ·0006487÷·0047
20 ·00001÷·002
21 94÷·00041
22 7÷·00087
23 6÷·0413
24 8476÷·029
25 ·029÷8476
26 ·0411÷42116
27 104÷·1049
28 61÷8419
29 ·00104÷·0011
30 943÷·00079

CASE 9.

Express in positive terms the value of the following decimals—

1 ·475 of £1.
2 ·0475 of £1.
3 ·091565 of £1.
4 ·75 of a guinea.
5 4·75 of £1.
6 4·0075 of £1.
7 2·045 of one shilling.
8 ·0945 of £1.
9 3·01875 of a guinea.
10 5·0005 of £1.
11 ·275 of one cwt.
12 ·675 of one mile.
13 ·625 of a ton.
14 ·0025 of a hhd.
15 7·0125 of a cwt.
16 ·07685 of £1.
17 ·42765 of 2s. 8½d.
18 ·725 of £1. 13s. 4d.
19 ·675 of £2. 4s. 6d.
20 3·7215 of 10 guineas.
21 ·600125 of one cwt.
22 ·475 of an acre.
23 ·45 of a ton.
24 7·045 of a guinea.
25 ·625 of an Eng. ell.
26 ·0625 of 3 guineas.
27 ·20015 of 7s. 5¼d.
28 7·12345 of 2s. 6d.
29 6·25 of £1.
30 7·0005 of £3.

CASE 10.

Reduce the following money, weights, &c., into decimals—

	Reduce	*to the dec. of*		*Reduce*	*to the dec. of*
1	5s.	£1.	16	3 qrs. 14 lb.	1 cwt.
2	4s.	£1.	17	2 qrs 19½ lbs.	1 cwt.
3	3s. 4d.	£1.	18	3 qrs. 11 lbs. 4oz.	1 ton.
4	4s. 6½d.	£1.	19	2 ft. 7 in. 1 b.c.	1 yd.
5	3s. 4¼d.	£1.	20	5 fur. 17⅓ p.	1 mile.
6	7s. 6½d.	£1.	21	6 fur. 15¼ p.	1 mile.
7	12s. 4¾d.	£1.	22	16 min. 16 sec.	1 hour.
8	15s. 7½d.	£1.	23	3 hrs. 3 m. 13 s.	1 day.
9	17s. 6¾d.	£1.	24	17 hr. 1 m. 12½ s.	1 wk.
10	19s. 11½d.	£1.	25	3 cwt. 1 q. 17½ lb.	1 ton.
11	7 oz. 5 dwt.	1 lb.	26	17 cwts. 11¼ lbs.	1 ton.
12	5 oz. 5 dwt. 3½ gr.	1 lb.	27	7 lbs. 7 oz. 14⅕ dr.	1 st.
13	9 oz. 14 dwt. 17 gr.	1 lb.	28	3s. 4⅕d.	1 crown.
14	1 lb. 14 oz. 3⅓ dr.	1 st.	29	7s. 2⅛d.	half-a-sov.
15	2 lbs. 7 oz. 6¼ dr.	1 qr.	30	6s. 4⅗d.	a guinea.

RULE OF THREE IN DECIMALS.

1 If 36¼ yards cost £3. 7s. 6d., what will 3⅕ yards cost?

2 If 73⅛ yards cost £5. 7s. 4¼d., what will 3 pieces, each 7⅗ yards, cost?

3 If 1 cwt. 1 qr. 11½ lbs. cost £3. 17s. 10½d., what will 17¼ lbs. cost?

4 If £5. 10s. 8¼d. will buy 2 cwt. 1 qr. 17⅗ lbs., what will £79. 15s. buy?

5 If £63. 19s. 7½d. will buy 24 cwts. 3 qrs. 3⅐ lbs., what will 7s. 4⅓d. buy?

6 If 7⅗ Eng. ells cost £2. 3s. 6⅓d., what will 147 yards 1 qr. 1¼ nl. cost?

7 How many Eng. ells may be bought for £57$\frac{1}{15}$, if 7·009 yards cost £1. 17s. 2·35d.?

8 If 17 pieces, each 14 yds. 1 qr. 1¼ nl. cost £75$\frac{5}{126}$, what will 4 Eng. ells 3 qrs. 2⅕ nls. cost?

9 A grocer bought 7⅕ chests of tea, each 2 qrs. 17¼ lbs., at 3s. 6⅛d. per lb., how should he sell it per cwt. to clear £2. 10s. 7·365d. by the sale?

10 A silversmith purchased silver to the amount of £197. 14s. $6\frac{1}{10}$d. at 4s. $6\frac{1}{5}$d. per oz.: how many silver cups, each requiring 10 oz. 14 dwts. 7·58 grs., would he be able to make from the whole?

⁂The questions given in the Rule of Three in Fractions may now be worked by Decimals.

EXERCISES IN FRACTIONS AND DECIMALS.

E 1.

1 Reduce the following mixed numbers to improper fractions—$7\frac{3}{5}$, $17\frac{4}{19}$, $5\frac{1}{6}$, $207\frac{3}{16}$, $4\frac{1}{29}$, $74\frac{2}{106}$.

2 Find the value of the following expression—

$$\left(\tfrac{1}{2}+\tfrac{2}{3}+\tfrac{1}{4}\right)\times\left(\tfrac{2}{5}+\tfrac{3}{7}-\tfrac{1}{6}\right)\times\left(\tfrac{7}{9}-\tfrac{8}{15}+\frac{1}{1\frac{1}{3}}\right).$$

3 How much silver may be bought for £$175{\cdot}3\dot{3}$, at 4s. $3{\cdot}6\dot{6}$d. per oz.? Work by fractions and prove by decimals.

4 Express the following in a fractional form—
(4·009 × ·7009 + 569 — 2·0097) ÷ 75·304.

5 Reduce 3s. $7\frac{1}{5}$d. to the fraction, and then to the decimal of a £, a guinea, and a crown.

6 Reduce the following fractions to their lowest terms—
$\frac{178}{654}$, $\frac{1188}{5640}$, $\frac{27}{243}$, $\frac{113}{1243}$, $\frac{7479}{82269}$, $\frac{637}{7644}$.

7 Simplify the following expression, and give the answer in a decimal form—

$$\frac{\frac{1}{3}+\frac{1}{6}+\frac{1}{9}}{\dfrac{1}{2\frac{1}{2}}+\dfrac{1}{2\frac{1}{3}}+\dfrac{1}{2\frac{1}{5}}}\times\frac{3\frac{1}{7}}{37\frac{10}{14}}$$

8 Simplify $\left\{3\tfrac{1}{3}+\tfrac{3}{5}\text{ of }\dfrac{7}{3\frac{1}{6}}-\dfrac{3\frac{1}{5}}{7\frac{1}{3}}\right\}\div 7\tfrac{11}{156}$.

9 How much tea could be bought for $73\frac{11}{12}$ guineas, if $3\frac{3}{4}$ lbs. cost $\frac{2}{3}$ of $\frac{3}{4}$ of £2·009?

10 Reduce $\frac{3}{13}$ of $\dfrac{2\frac{3}{5}}{7\frac{1}{9}}$ of $\dfrac{6\frac{4}{13}}{18\frac{12}{13}}$ to a simple fraction.

E 2.

1 Reduce the following fractions to their lowest terms—
$\frac{17}{153}$, $\frac{114}{1938}$, $\frac{111}{2109}$, $\frac{7364}{51548}$, $\frac{1419}{12771}$, $\frac{63}{945}$, $\frac{214173}{1927557}$.

2 Reduce the following improper fractions to mixed numbers—$\frac{117}{23}$, $\frac{127}{46}$, $\frac{124}{33}$, $\frac{947}{173}$, $\frac{476}{23}$, $\frac{294}{27}$.

3 Simplify the following expression—

$$\left\{\left(\tfrac{2}{3} + \tfrac{7}{9} + \tfrac{1}{21}\right) \div \left(\tfrac{5}{7} + \tfrac{1}{35} - \tfrac{1}{70}\right)\right\} \times \frac{7\frac{3}{16}}{21\frac{9}{16}}.$$

4 Give the answer to the following expression in a fractional form—
$(6{\cdot}009 \times 14\frac{2}{5} + 7{\cdot}3617 - 7\frac{1}{10} + {\cdot}2014 - 1\frac{1}{15})$.

5 A grocer bought 7 casks of sugar, each 4 cwt. 1 qr. 11⅕ lbs., at 5¼d. per lb., and sold the whole at £2. 19s. 7⅗d. per cwt., what did he gain by the transaction? Work by fractions, and prove by decimals.

6 Divide $(7\frac{3}{5}+\frac{1}{6}+11\frac{1}{3})$ by 9, ·09, ·009 and ·0009, successively, and give your reasons for placing the decimal points.

7 Multiply $7\frac{1}{3}$ by $4\frac{1}{8}$; and divide $\dfrac{4\frac{1}{7}}{12\frac{3}{7}}$ by $\dfrac{7\frac{1}{9}}{64}$; then add the two results together.

8 What number subtracted from $73\frac{1}{19}$ will leave $4\frac{3}{127}$?

9 What number multiplied by $27\frac{3}{17}$ will produce 46·004?

10 Express the sum of $\cdot\dot{8}5714\dot{2}$ of £3; $\frac{2}{3}$ of $\frac{3}{7}$ of £2·45, and $\cdot\dot{3}\dot{3}$s. as the fraction of £2. 17s. 6⅕d.

E 3.

1 Reduce $\left\{\dfrac{2{\cdot}5}{17{\cdot}5} \times \dfrac{{\cdot}015}{165} \times \dfrac{94}{1{\cdot}175}\right\} \div \dfrac{7\frac{3}{19}}{85\frac{17}{19}}$ to a simple quantity.

2 What decimal is £2. 17s. $2\frac{1}{4}$d. of £7. 10s.?

3 What number added to $2\frac{1}{19}$ will produce $7\frac{3}{15}$?

4 What must $27\frac{3}{23}$ be divided by, to leave $3\frac{16}{17}$ for a quotient?

5 From 2·4747 take ·8417419, and to the difference add $(\frac{7}{15} + \frac{1}{16} + \frac{1}{30})$.

6 Reduce 1 qr. 1 lb. 1 oz. first to the fraction, and then to the decimal of a stone, a cwt. and a ton.

7 Multiply 2s. 4·175d. by (·091 ÷ 57).

8 Simplify the expression
$$\frac{\frac{2}{7} + \frac{1}{5} + \frac{1}{9}}{\dfrac{7}{8\frac{1}{3}} + \dfrac{7}{9\frac{1}{4}} + \dfrac{7}{10\frac{1}{5}}}$$

9 Find the vulgar fraction equivalent to—

$$(\cdot 291\dot{6} + \cdot 98958\dot{3} - \cdot\dot{7} + \cdot 0\dot{7} + \cdot 2\dot{2}\dot{7}) \div \cdot 7854.$$

10 A draper bought 147 yds. 1 qr. $3\frac{1}{5}$ nls. of cloth for 4s. $1\frac{1}{3}$d. per yard, and 73 Eng. ells $2\frac{1}{3}$ qrs. at 5s. $3\frac{1}{4}$d. per yard: he gave a cheque for £59. 17s. $4\frac{1}{2}$d. in payment for the whole: what change ought he to receive? Work by fractions, and prove the truth of the answer by decimals.

E 4.

1 Reduce the following mixed numbers to improper fractions—$9\frac{1}{5}$, $7\frac{2}{9}$, $6\frac{1}{3}$, $14\frac{1}{12}$, $19\frac{2}{17}$, $127\frac{1}{15}$, $9\frac{1}{111}$.

2 Multiply $7\frac{1}{3}$ of $\dfrac{2\frac{1}{6}}{21\frac{2}{3}}$ by ·04739.

3 Reduce 17s. $4\frac{4}{5}$d. first to the fraction and then to the decimal of a shilling, a half-crown, a half-sovereign, a pound, and a guinea.

4 Divide £27. 17s. $6\frac{3}{7}$d. separately by 2, 3, 4, 5, 6, 7.

5 Divide £19. 4s. $6\frac{1}{5}$d, separately by 3, ·03, 30, ·003.

6 Simplify the following expression—

$$\left\{\frac{\frac{3}{5} + \frac{7}{15} - 2\frac{1}{3}}{6\frac{1}{9} + 7\frac{1}{3} - 8\frac{1}{5}}\right\} \times (7{\cdot}001 \div {\cdot}0014).$$

7 What decimal is 7s. $2\frac{1}{3}$d. of two guineas?

8 What fraction is 4s. $11\frac{1}{5}$d. of three guineas?

9 Divide $(7{\cdot}36+11\frac{1}{6}-7\frac{2}{3})$ by 94, ·94 and ·094 separately, and give your reasons for placing the decimal points.

10 Find the vulgar fraction equivalent to $7{\cdot}457\dot{4}5\dot{7}$ and subtract it from $9\frac{29}{161}$.

E 5.

1 Reduce the following fractions to their lowest terms—$\frac{7}{84}$, $7\frac{56}{728}$, $4\frac{19}{228}$, $26\frac{11}{132}$, $4\frac{1174}{4696}$, $99\frac{4134}{45474}$.

2 Place four threes, so that they may be equal to 1, 14, 34, or 111.

3 What is the value of $\frac{3}{5}$ of £7. 7s. $6\frac{1}{3}$d.? and prove it.

4 Reduce 2 qrs. 11 lbs. $7\frac{3}{5}$ oz. first to the fraction, and then to the decimal of a cwt.

5 What parts of a £ are 3s. $4\frac{1}{3}$d. and 4s. $7{\cdot}\dot{5}2380\dot{9}$d.?

6 Simplify $\dfrac{\frac{2}{3}\times{\cdot}\dot{5}2380\dot{9}}{\frac{11}{21}\times{\cdot}11\dot{1}\times 6}\div\dfrac{\frac{7}{8}\times{\cdot}0\dot{4}\dot{7}}{\frac{1}{42}\times{\cdot}2\dot{6}1904\dot{7}}$.

7 Reduce the following expression to a simple form—

$$\left\{(\tfrac{7}{9}+3\tfrac{1}{3}-1\tfrac{1}{6})\times(7\tfrac{4}{9}+2\tfrac{3}{5}-7\tfrac{1}{9})\right\}\div\left\{\frac{2\frac{2}{7}}{16\frac{1}{4}}+\frac{7\frac{1}{5}}{9\frac{2}{3}}\right\}.$$

8 Multiply £74. 7s. $6\frac{5}{7}$d. separately by 2, 3, 4, 5, 6, 7.

9 Divide 1 ton 1 cwt. $1\frac{1}{12}$ qrs. separately by 2, 3, 4, 5, 6, 7.

10 Bought $11\frac{7}{8}$ yards of cloth for £5. 7s. $5\frac{1}{2}$d., what will $3\frac{1}{3}$ pieces, each measuring $36\frac{1}{5}$ yards cost, at the same rate? Work by fractions and prove the truth of the answer by decimals.

E 6.

1 Reduce the following mixed numbers to improper fractions—$9\frac{1}{11}$, $7\frac{4}{23}$, $64\frac{1}{17}$, $8\frac{1}{19}$, $274\frac{1}{16}$, $7\frac{7}{141}$.

2 Reduce the following circulating decimals to their equivalent vulgar fractions—${\cdot}15\dot{9}\dot{0}$, ${\cdot}47\dot{2}$, ${\cdot}1\dot{1}5384\dot{6}$, ${\cdot}00\dot{0}13\dot{2}$, ${\cdot}0147\dot{1}4\dot{7}$.

3 Divide $74\cdot\dot{0}1234567\dot{9}$ by $(\frac{3}{5}+\frac{7}{25}-\frac{1}{50})$.

4 Reduce 1 qr. 17 lbs. 11 oz. $2\frac{3}{5}$ drs. first to the fraction and then to the decimal of a ton.

5 Give the value of the following expression in a fractional form—
$(2\cdot74+247\cdot1-\cdot0019\times\cdot0119) \div 7\frac{11}{13}$.

6 Give the value of the following expression in a decimal form—

$$\left\{\frac{3}{1\frac{1}{7}}+\frac{2}{7\frac{1}{3}}+\frac{7\frac{3}{5}}{15\frac{1}{5}}\right\}\div(5\tfrac{26}{27}+7\tfrac{1}{9}).$$

7 What number subtracted from $11\frac{1}{12}$ will leave $2\frac{2}{13}$?

8 What number divided by $1\frac{1}{11}$ will give $17\frac{3}{5}$ for a quotient?

9 Divide the sum of $57\cdot36$ and $\cdot0179$ by their difference.

10 Find the difference between $3\frac{4}{7}$ guineas and £$3\cdot6559\dot{9}0\dot{3}$, and reduce the result to the fraction, and then to the decimal of a £.

E 7.

1 Add together $\frac{1}{2}+\frac{3}{4}+\frac{5}{16}+\frac{7}{32}$. and convert the answer into a decimal.

2 Subtract $7\frac{4}{5}$ from $8\frac{2}{3}$, and multiply the difference by $\cdot0974$.

3 Divide $\frac{157}{699}$ by $\cdot07$; $\cdot07$ by $\frac{9}{23}$, and $(\frac{2}{3}+\frac{1}{18})$ by $\cdot03\dot{5}$.

4 Express 1s. $1\frac{3}{7}$d. as the fraction of a guinea.

5 Express 1 yd. 1 qr. $1\frac{1}{3}$ nl. as the decimal of an Eng. ell.

6 Reduce the following expression to its simplest form—

$$\left\{\frac{2\frac{2}{5}}{11\frac{1}{7}}+\frac{\frac{1}{2}}{3\frac{1}{4}}+\frac{7\frac{1}{6}}{4}\right\}\div\left\{\frac{2\frac{2}{7}}{7\frac{1}{9}}+1\frac{3}{5}-\frac{1\frac{1}{2}}{4\frac{1}{2}}\right\}.$$

7 Give the answer to the following expression in a fractional form—$(\cdot0073+7\cdot46+949\cdot1-\cdot074)\div\cdot9426$.

8 Find the sum and the difference of $13\frac{5}{7}$ and $8\frac{2}{21}$, then multiply the sum by the difference.

9 How much sugar may be bought for £127. 7s. $6{\cdot}08\dot{3}$d. if $\cdot 00\dot{9}$ cwt. cost £$\frac{7}{430}$? Work by decimals and prove by fractions.

10 Reduce to its simplest form $\left\{\left(\frac{5}{2}-\frac{2}{5}\right)\div\left(\frac{4}{3}-\frac{3}{4}\right)\right\}^2$, and convert the answer into a decimal.

E 8.

1 Add together 5·036 + 749·01 + ·001 and divide the result by ·0419.

2 Reduce $\frac{1}{64}$ to a decimal, and multiply the result by ·0419.

3 Reduce the following mixed numbers to improper fractions—$4\frac{2}{9}$, $7\frac{2}{15}$, $18\frac{4}{27}$, $11\frac{11}{111}$, $74\frac{2}{19}$.

4 Simplify the following expression—

$$\left\{\frac{16}{11} \text{ of } \frac{111\frac{9}{13}}{108} \text{ of } \frac{\frac{72}{147}}{\frac{18}{25}} \text{ of } \frac{6\frac{8}{15}}{24\frac{8}{13}} \text{ of } 8\frac{55}{64}\right\} \div \cdot 007.$$

5 Simplify the following expression—

$$\left\{\frac{\frac{2}{7}+\frac{3}{7}+\frac{4}{7}-\frac{1}{9}}{7\frac{3}{5}+8\frac{1}{6}+9\frac{1}{7}+10\frac{1}{10}}\right\} \times 11\frac{5}{19}.$$

6 Express 7s. $2\frac{1}{3}$d. as the fraction of a guinea, a pound, and a crown.

7 Express 9s. $4\frac{1}{5}$d. as the decimal of a guinea, a pound, and a crown.

8 Bought $3\frac{1}{2}$ pieces of silk, each $17\frac{3}{8}$ Eng. ells, at 6s. $0\frac{3}{4}$d. per ell; how must it be sold per yard to clear £5. 0s. $6\frac{1}{5}$d. by the sale? Work by decimals, and prove the work by fractions.

9 Multiply $\left(\frac{2}{3}+\frac{3}{19}+\frac{1}{36}-\frac{1}{38}\right)$ by $\dfrac{2\frac{2}{3}}{7\frac{1}{12}}$.

10 Find the value of the following expression—

$$\left(\frac{2}{5} \text{ of } \frac{13}{16}\right) - \left\{\frac{1\frac{2}{3}}{6\frac{2}{3}} \text{ of } \frac{14}{15}\right\} + \left\{\frac{5\frac{1}{3}}{9\frac{1}{7}} \text{ of } \frac{7\frac{5}{12}}{37\frac{1}{12}}\right\}$$

and reduce the result to a decimal.

E 9.

1 Reduce the following expression to its simplest form—

$$\left\{\left(\tfrac{3}{7}+\tfrac{9}{19}+\tfrac{4}{21}\right)\times\left(\tfrac{9}{17}-\tfrac{1}{14}+\tfrac{2}{34}\right)\right\}\div\frac{7\frac{3}{5}}{8\frac{4}{9}}.$$

2 Find the difference between nine, and nine-tenths; and the sum of nine-tenths, and nine millionths; then multiply the sum by the difference.

3 Divide $\dfrac{2\frac{1}{11}}{8\frac{8}{22}}$ by $\dfrac{7\frac{1}{15}}{63\frac{27}{45}}$.

4 Reduce the following fractions to their lowest and simplest forms—
$9\frac{3}{48}$, $7\frac{16}{9}$, $11\frac{24}{7}$, $6\frac{4}{16}$, $127\frac{63}{756}$, $74\frac{108}{432}$.

5 What will $123\frac{5}{8}$ yards cost, if 5·725 Eng. ells cost 27·00125s.? by fractions and decimals.

6 What will $5\frac{1}{4}$ pieces of silk, each $27\frac{3}{8}$ yds. cost, if £2·00195 be given for $4\frac{4}{7}$ Eng. ells? Work by fractions and prove it by decimals.

7 Reduce 7s. $10\frac{1}{8}$d. to the fraction of a £.

8 Reduce 3 wks. 4 days 19 hrs. to the decimal of a year.

9 Divide 7300·95 separately by 7309, 730·9, 73·09, 7·309, ·7309, ·07309, and ·007309, and give your reasons for placing the decimal points in each case.

10 Reduce $\dfrac{7{\cdot}236}{80{\cdot}4}$ of $\dfrac{12}{{\cdot}0015}$ of $\dfrac{{\cdot}035}{{\cdot}007}$ of $\dfrac{9}{6\frac{5}{8}}$ to a simple fraction.

E 10.

1 Express in a decimal form the result of five-tenths + seven-hundredths + seventeen-thousandths + nine-ten-thousandths + fifteen millionths.

2 Reduce 7 oz. 5 drs. 2 scrs. $17\frac{1}{2}$ grs. to the fraction, and also to the decimal of a pound, and show that the two answers agree.

3 Divide the sum of 274 + 27·4 + ·0074 by the difference between 7 and ·0007.

4 Express the result of the following expression in a decimal form $\left(4\frac{2}{5}+6\frac{1}{7}-3\frac{1}{3}\right)\times\left(2\frac{1}{6}+7\frac{2}{9}-1\frac{1}{4}\right)$.

5 Simplify the following expression—

$$\left\{\frac{4\frac{2}{7}-2\frac{1}{8}}{4\frac{2}{7}+2\frac{1}{8}}+\frac{7\frac{1}{4}-3\frac{1}{5}}{7\frac{1}{4}+3\frac{1}{5}}\right\}\div \cdot00073.$$

6 Reduce 17s. $4\frac{1}{7}$d. to the fraction and also to the decimal of a £.

7 If 7·625 cwts. cost $\frac{3}{7}$ of $\frac{3}{5}$ of $\frac{7}{13}$ of £140·095, what will $\frac{7\frac{3}{5}}{14\frac{1}{9}}\times\frac{2\frac{1}{7}}{7\frac{3}{13}}$ of 2·065 tons cost? Work by fractions, and prove the truth of the result by decimals.

8 Simplify the following expressions—

$$1\tfrac{1}{13} \text{ of } \frac{1}{\dfrac{1+\frac{1}{3}}{3+\frac{1}{4}}}. \quad\text{and } 2\tfrac{1}{2}\times\frac{1}{3\frac{1}{3}+\dfrac{1}{4\frac{1}{4}}}.$$

9 Reduce to decimals, $3\frac{1}{8}$ of $\frac{1}{312}$; $\frac{2\frac{3}{4}}{12\frac{7}{8}}$ of $6\frac{13}{14}$; $\frac{7\frac{3}{5}}{9\frac{1}{2}}$ of $\frac{2\frac{1}{3}}{2\frac{4}{5}}$ of $\frac{7}{8}$; $5\frac{1}{720}+(\frac{2}{3}$ of $\frac{1}{7})+6\frac{1}{2}$; and $2\frac{4}{17}$ of $\frac{11}{113}$ of $56\frac{7}{1000}$.

10 Reduce into a fractional form—

$$(\cdot7009+14\cdot065+9174-\cdot9174)\div\frac{7\frac{3}{26}}{9\frac{11}{17}} \text{ of } \frac{12\frac{13}{17}}{56\frac{19}{26}}.$$

EXTRACTION OF THE SQUARE ROOT.

Extract the square root of—

1 441
2 484
3 676
4 841
5 1764
6 2304
7 3364
8 4761
9 5184
10 7396
11 10201
12 10609
13 12321
14 17161
15 25921
16 38809
17 44521
18 46656
19 60516
20 101761
21 110889
22 119716
23 156025
24 169744

25 209764
26 456208386624
27 255942904464
28 21025
29 4160580062500
30 14356521
31 620944
32 4096
33 5345344
34 167·9616
35 807·48610569
36 ·015241383936
37 ·00203401
38 ·042849
39 ·00076128
40 9712·71105
41 ·000089415936
42 152·2756
43 16 and 1·6
44 ·16, ·1, and ·016
45 5, ·5, and ·05
46 $7\frac{9}{16}$ and $\frac{16}{49}$
47 $\frac{3044}{6849}$ ... $\frac{16}{25}$
48 $\frac{3136}{5041}$ ... ·2
49 $\frac{7056}{9216}$ ... ·02
50 $37\frac{36}{49}$ ... $9\frac{15}{16}$
51 $7\frac{1}{2}$ ... ·5002
52 $6\frac{3}{7}$ ... ·001
53 $51\frac{21}{25}$ ... $8\frac{5}{7}$
54 $27\frac{9}{16}$ ... $\frac{478}{479}$
55 $7\frac{5}{12}$ ... ·0001
56 $6\frac{5}{13}$ ... ·00001

EXTRACTION OF THE CUBE ROOT.

Extract the cube root of—

1 1331
2 4096
3 9261
4 17576
5 29791
6 50653
7 74088
8 132651
9 195112
10 373248
11 531441
12 704969
13 6128487
14 9393931
15 10077696
16 21717639
17 191102976
18 502459875
19 601211584
20 997002999
21 12·977875
22 ·001906624
23 36155·02756
24 ·000004949175699
25 3, ·3, and ·03
26 7, ·7, and ·007
27 $\frac{8}{27}$ ... $\frac{5}{9}$
28 $\frac{343}{729}$ ... $\frac{4}{7}$
29 $5\frac{104}{125}$ ... $7\frac{1}{5}$
30 $12\frac{19}{27}$ ... $6\frac{1}{4}$
31 $405\frac{28}{125}$.. ·0901
32 $2\frac{4}{9}$ ... 1·09
33 74, 7·4, and ·74
34 ·000672912250947

MENSURATION OF SUPERFICIES.

PROBLEM 1.

To find the area of a parallelogram, whether it be a square, a rectangle, a rhombus, or a rhomboid.

1 Find the area of a square whose side is 194 feet.

2 Find the area of a square whose side is 176 yards.

3 The side of a square measures 47·25 chains, find its area.

4 A square mahogany table measures 6 feet 7 inches in length and breadth; what is its area?

5 The base of the largest Egyptian pyramid is a square, whose side measures 693 feet; how many acres of ground does it cover?

6 The area of a square table is 37 feet 8 inches, find the length of its side.

7 The area of a square field is 3 a. 1 r. 17⅓ per.; find the length of the side.

8 A rectangular board is 12¼ feet long, and 9¼ inches broad; how many square feet are contained in 13 such boards?

9 A court yard measures 24 yards 1 foot in front, and 17 yards 2½ feet deep; a footpath leads from the front to the house 7 feet 9 inches broad; what will be the expense of covering the footpath with asphalte at 11½d. per square yard, and the remaining part of the yard with common stones, at 5¼d. per square yard?

10 The area of a rectangular field is 7 a. 1 r. 11½ per., its length is 317⅙ yards, what is its breadth?

11 A window contains 76 panes of glass, each in the form of a rhombus, 8⅚ inches long and 6¼ inches broad; what will the window cost glazing at 1s. 5½d. per square foot?

12 A square garden contains 1 a. 2 r. 13¼ per.; what will be the expense of making a footpath from one corner through the centre to the opposite one, at 7½d. per lineal yard?

13 The sides of three squares are 4½, 6⅓, and 9¼ feet, find the diagonal of that square whose area is equal to the area of all the three?

PROBLEM 2.

To find the area of a triangle.

1 The base of a triangle is 175 yards, and its perpendicular breadth 79¼ yards, ; find its area.

2 The base of a triangle is 17 feet 3 inches, and its perpendicular height 9 feet 4½ inches ; find its area.

3 A grass plot is in the form of an equilateral triangle, and its side measures 72 feet; find its area.

4 Find the area of an isosceles triangle whose base is 17 feet 6 inches, and each of the equal sides 19 feet.

5 Find the area of a triangle whose three sides measure 27, 49, and 30 feet.

6 The area of a triangular garden is 1 a. 1 r. 9¼ per., its base measures 117·4 yards ; what is its perpendicular breadth ?

7 The three sides of a triangle are 24, 27, and 35 yards ; find the diameter of the inscribed circle.

8 A gentleman has a triangular garden containing 1⅓ acre, the perpendicular breadth is 89¼ yards : what would be the expense of placing a palisade along the front, at 2s. 6d. per yard ?

9 The area of an equilateral triangle is 1749·3, and the perpendicular breadth is 46·3 ; what is the radius of the inscribed circle ?

10 The three sides of a triangle are 19, 17, and 26 feet ; what is the length of the diagonal of a square whose area is equal to that of the triangle ?

PROBLEM 3.

Right-angled triangles.

1 The base of a right-angled triangle is 35, and the perpendicular 45 ; what is the hypothenuse ?

2 The base of a right-angled triangle is 47¼, and the perpendicular 40⅛ ; find the hypothenuse.

3 The hypothenuse is 117·3 and the perpendicular 99⅕, what is the base?

4 The hypothenuse is 90·06, and the base 74¼ ; find the perpendicular.

5 The area of a square garden is 1⅛ acre; find the length of the diagonal.

6 The area of a rectangular garden is 1⅙ acre, the length is 156⅕ yards ; find the length of the diagonal.

7 The area of a square garden is 1⅞ acre ; what is the length of a footpath from the centre to any one of the angles ?

8 The area of a rectangular garden is 2 a. 3 r. 19⅛ per., and its breadth 59⅛ yards ; what will be the expense of making a footpath from one corner through the centre to the opposite one at 1s. 8½d. per lineal yard ?

9 A barn is 37¼ feet high, and a ladder of the same length is fastened to its side : if two boys pull the foot of this ladder 3½ yards from the bottom, how far will the top of the ladder be from the top of the barn ?

10 The perpendicular of an isosceles triangle is 119⅕ yards, and one of the equal sides is 123¼ yards ; find the difference between the base of the triangle and one of the equal sides.

11 A building on one side of a street, 12½ yards wide, is 11¾ yards high ; what must be the length of two ladders to reach from the opposite side of the street, the one to the top of the building, and the other to a window 3¾ yards from the top ?

12 A ladder 36 feet long, when placed in a street, reaches a window 32·05 feet high, and by turning it over, without removing the foot, it will reach a window 17⅛ feet high on the other side of the street ; what is the breadth of the street ?

13 The area of an isosceles triangle is 1174·5 yards, and the base is 54·0475 yards ; find the perimeter of the triangle.

14 The area of an isosceles triangle is 862·059 yards, and the perpendicular is 43·0125 yards ; find the difference between the length of one of the equal sides and the base.

15 The diagonal of a square garden is 173⅕ yards ; what will the garden cost fencing at 3½d. per yard ?

PROBLEM 4.

To find the area of a trapezium, or of a trapezoid.

1 The diagonal of a trapezium is 112 feet 3 inches, and the two perpendiculars falling upon it from the opposite angles are 46, and 57½ feet ; what is its area ?

2 Find the area of a trapezoid whose parallel sides are 35 and 39½ feet, and its perpendicular breadth 19·05 feet.

3 Find the area of a field in the form of a trapezoid, whose parallel sides measure 850 and 947 links, and its perpendicular breadth 695 links.

4 The diagonal of a trapezium measures 749¼ links, and the two perpendiculars 117 and 129 links; what is its area?

5 In the quadrangular field A B C D, on account of obstructions, there could only be taken the following measures, viz.:—the two sides B C, 245; and A D, 230 yards; and the diagonal, A C, 472 yards; also the two distances of the perpendiculars from the ends of the diagonal, A E, 115, and C F, 79¼ yards. What is the area of the field?

6 Find the area of a trapezium, whose south side measures 735 links; east side, 947 links; north side, 1174; and the west side, 816 links; also the diagonal, from the south-west to the north-east angle 1350 links.

PROBLEM 5.

To find the area of any irregular figure.

1 Find the area of a pentangular field, whose first side measures 743; the second, 475; the third, 699; the fourth, 842; and the fifth, 569 links; also the diagonal, from the first to the third angle, as well as that from the third to the fifth angle, measures 1160 links.

2 Find the area of a field of six sides, and draw the figure from the following data:—A C, from west to east, is the diagonal, 1175 yards; A m, in A C, the place of the first perpendicular, 275; m G, the perpendicular to the south of A C, 289; m n, in A C, the place of the second perpendicular, 642; n B, the perpendicular to the north of A C, 294; G q, in G C, the place of the perpendicular, 410; q D the perpendicular, 212; A o, in A B, the place of the perpendicular, 424; o E, the perpendicular, 411.

PROBLEM 6.

Regular polygons.

1 The side of a pentagon is 5 feet 3 inches; find the radii of its inscribed and circumscribing circles.

2 The side of a hexagon is 6 feet 6 inches; find the radii of its inscribed and circumscribing circles.

3 The side of a pentagon is 21·75, a circle is described in it, and one about it; find the difference in length of the two radii.

4 The side of an equilateral triangle is 19·5; what is the diameter of its inscribed circle?

5 The radius of a circle is 21·35; what is the length of the side of its inscribed heptagon?

6 The radius of a circle is 19·75, a hexagon is described in it, and one about it; find the difference in the length of the sides.

7 The perimeter of a nonagon is 135; what is the diameter of its circumscribing circle?

8 The perimeter of a pentagon is 155, an isosceles triangle is described in it, whose base coincides with the base of the pentagon, and the vertex of the triangle with the vertex of the pentagon; what is the perimeter of the triangle?

9 The side of a hexagon is 23·75; what is its area?

10 The side of a pentagon is 13·045; find its area.

11 The perimeter of a heptagon is 112·462; find its area.

12 The diameter of a circle is 25·5; what is the area of its inscribed nonagon?

13 The diameter of a circle is 27·025, a pentagon is described in it, and one about it; find the difference in area of the two pentagons.

14 The area of a heptagon is 1445; find the length of a line from the middle of the base to the vertex.

15 The perimeter of an octagon is 160·016; find the difference in length of two lines, one from the middle of one side to the middle of the opposite one, and the other from one angle through the centre to the opposite one.

16 A hexagon contains 1½ acre; what is the length of a line from one angle through the centre to the opposite one, and of another from the middle of one of the sides to the middle of the opposite one?

17 In a gentleman's pleasure ground stands a conical obelisk, $13\frac{5}{8}$ yards high, which is in the centre of a hexagonal plot; what is the area of this plot, if a rope $35\frac{7}{8}$ yards long will reach from the top of the obelisk to any of the angles?

18 A gardener wishes to make a pentagonal grass plot, which shall contain 1437·56 square yards, what must be the length of the side?

PROBLEM 7.

Circles.

1 If the diameter of a wheel be 6 feet 6 inches, what is its circumference?

2 If the radius of a wheel be 3 feet $11\frac{1}{3}$ inches, find its circumference.

3 If the circumference of a circle be 19 feet $8\frac{1}{5}$ inches, find the diameter.

4 If a coach wheel turn round 357 times in passing over a mile, what is its radius?

5 A circular fishpond is to be made in a garden which shall occupy an acre of ground; what will be the length of the rope that marks out the circle?

6 Suppose the expense of paving a semi-circular plot, at 2s. 6d. per foot, came to £11. 10s. 6d.; what is its diameter?

7 What is the area of a circular table whose diameter is 5 feet $8\frac{1}{4}$ inches?

8 The surveying wheel turns exactly twice round in passing over one pole; find its radius.

9 Find the difference in perimeter, of a square, an equilateral triangle, and a circle, supposing the area of each to be an acre.

10 The three sides of a triangle are 27, $49\frac{1}{4}$, and $36\frac{1}{3}$ yards; find the area of the inscribed circle.

11 The radius of a circle is $39\frac{1}{4}$ yards; what is the diagonal of a square six times its area?

12 The area of a circle is 2927·03311824; suppose a regular pentagon to be inscribed in it, what is the greatest breadth of one of the segments bounded by the side of the pentagon and the arc of the circle?

13 The area of a semi-circle is 942·8727; suppose an isosceles triangle described in it, whose base equals

the diameter, and its vertex is in the circumference, what will be the area of the segment contained by the side of the triangle, and the arc of the circle?

14 The area of a square is 11a. 0r. 4per., find the difference between the area of a circle inscribed in it, and that of a circle described about it.

15 The perimeter of a regular hexagon is 123·9; find the difference between its area and that of a circle inscribed in it.

16 The diagonal of a square is 9·7 feet, what is the radius of a circle 3½ times its area?

17 A gentleman wishes to lay out a circular plantation, round which there shall be a gravel walk which shall contain ⅛ part as much as the planting; what will be the breadth of the walk, and the radius of the planting, if the ground planted occupy 7¼ acres?

18 If a yard square of cardboard be divided into four equal squares, by lines bisecting the sides at right angles, how much of it will be left, when the four circles that can be inscribed in these squares are cut out?

19 If the area of a circle be 1¼ acre, and an isosceles triangle be inscribed in it, the greatest possible, whose base is 45·32 yards, what will be the difference between the perimeter of the circle and that of the triangle?

20 The area of a circle is 176·715, a regular heptagon is inscribed in it; suppose an isosceles triangle to be described in it, the greatest possible, whose base coincides with a side of the heptagon; find the difference between the perimeter of the triangle and that of the heptagon.

PROBLEM 8.

To find the length of an arc of a circle.

1 The chord of the whole arc is 47, and the chord of half the arc is 27·5; find the length of the arc.

2 The chord of the whole arc is 53½, and the versed sine 24; what is the length of the arc?

3 The chord of half the arc is 27·35, and the versed sine 24·5; find the length of the arc.

4 The chord of half the arc is 37½, and the versed sine 31; what is the length of the arc?

5 The chord of half the arc is $24\frac{1}{6}$, and half the chord of the whole arc is $19\frac{1}{8}$; find the length of the arc.

6 The chord of the whole arc is $29\frac{7}{8}$, and the perpendicular distance between it and the centre is $7\frac{3}{8}$; find the length of the arc.

7 The area of a circle is 456·745, and the chord of the whole arc is 14·75; find the length of the arc.

8 The area of a semi-circle is 247·5, and the chord of the arc 19·65; find the length of the arc.

9 The area of a circle is 535·16, and the versed sine is 15·75; find the length of the arc.

10 The area of a circle is 471·95, and the perpendicular distance between the chord and the centre is 6·875; find the length of the arc.

PROBLEM 9.

To find the area of a sector or a segment of a circle.

1 Find the area of a sector of a circle whose radius is 17, and the chord of the whole arc $24\frac{1}{6}$.

2 Find the area of the sector of a circle whose radius is $14\frac{1}{8}$, and the versed sine $5\frac{1}{4}$.

3 Find the area of the segment of a circle, whose diameter is 25, and the chord of the whole are $17\frac{1}{4}$.

4 Find the area of the segment of a circle whose diameter is $19\frac{1}{8}$, and the versed sine $3\frac{1}{4}$.

5 Find the area of the sector of a circle whose chord of the whole arc is $29\frac{5}{8}$, and the area of the circle 987·5625.

6 What is the area of the segment of a circle whose chord is 16, and the diameter of the circle $16\frac{2}{3}$?

7 What is the area of the segment of a circle whose arc is a quadrant, and the diameter of the circle $24\frac{1}{4}$?

8 Find the area of the segment of a circle whose chord is $18\frac{3}{4}$, and the versed sine $2\frac{3}{4}$.

9 Required the area of a sector greater than a semi-circle, the chord of the arc being 14, and the diameter $17\frac{5}{8}$.

10 What is the area of a segment of a circle the arc of which is a sextant, and the circumference of the circle $74\frac{1}{10}$ feet?

11 The perpendicular distance between the diameter and the chord of a circle is $7\frac{3}{8}$, and the length of the

chord is 59⅛; what is the area of the space between them?

12 The perpendicular distance between the diameter and the chord of a circle is 9⅕, and the versed sine is 7¼; what is the area of the segment?

PROBLEM 10.

To find the area of a circular ring.

1 Find the area of a circular ring contained between two concentric circles whose diameters are 10¼ and 13⅕.

2 Find the area of a circular ring, the circumferences of the containing circles being 27⅛ and 41⅕.

3 The diameters of two concentric circles are 62·85 and 41·75; find the area of the ring.

4 The circumferences of two concentric circles are 61·457 and 84·5; find the area of the contained ring.

5 A ditch 14½ yards wide surrounds a circular fortress, the circumference of the fortress being half a mile; find the area of the ditch.

6 The circular fences on each side of a gravel walk, surrounding a shrubbery are 925 and 811 feet in length; find the area of the walk.

7 Find the expense of making a moat round a circular island, at 1s. 8d. per square yard, the circumference of the island being a quarter of a mile, and the breadth of the moat 17⅛ feet.

8 A gentleman wishes to make a circular pond in his grounds with a walk round it 6½ feet wide, the pond is to occupy 2½ acres; what will be the area of the walk?

9 A garden walk, 4½ feet wide, is carried round a circular plot 14¼ yards in diameter; what will the walk cost gravelling at 2¼d. per square yard?

10 The area of a circular ring is 646·75, and the circumference of the inner circle is 69⅛; what is the breadth of the ring?

11 The area of a circular ring is 614·25, and the circumference of the outer circle is 124⅕; what is the breadth of the ring?

12 The area of a circular ring is 942·125, the circumference of the outer circle 141·5, and the chord of the

whole arc of the outer circle 36½; find the area of the triangle formed by the radii of the two circles and that part of the chord which crosses the ring.

PROBLEM 11.

To find the area of a circular zone.

1 The parallel chords of a zone are each 76, and the perpendicular distance between them is 20; find its area.

2 One of the parallel chords of a zone is equal to the diameter, which is 50, and the other is 36; find the area of the zone.

3 Find the area of a circular zone, the parallel chords of which are 90 and 50, and their distance 20½.

4 The area of a circle is 956·45; if two parallel chords, each 24½ be drawn across it, find the area of the space between them.

5 The diameter of a circle is 40, and two parallel chords on the same side of it are 35 and 19; find the area of the zone.

6 The diameter of a circle is 40, and two parallel chords on opposite sides of it are 35 and 19; find the area of the zone.

PROBLEM 12.

To find the area of a lune.

1 The chord is 17, and the heights of the two segments 8 and 3; find the area of the lune.

2 The chord is 24, and the heights of the segments are 10 and 5½; find the area of the lune.

3 The chord of a lune is 30½, and the heights of the segments are 5 and 17¼; find its area.

4 Supposing the area of a circle to be 1728, and the diameter to be the chord of a lune, whose two segments are respectively 18 and 7 in height; what is the area of the lune?

PROBLEM 13.

To find the area of an ellipse, or of an elliptical segment.

1 Find the area of an ellipse whose two axes are 70 and 53 feet.

2 Find the area of an ellipse whose two axes are 26½ and 19¼ feet.

3 The diameters of an ellipse are 64 and 89 feet, and the height of a segment, cut off by a line parallel to the longer diameter is 17¼ ; find its area.

4 There is a shrubbery in a gentleman's park in the form of an ellipse, whose two diameters are 350 and 240½ feet ; what is its area?

5 What is the area of an elliptical segment cut off by a line parallel to the shorter diameter, the height being 7½ feet, and the axes 25 and 88½ feet?

6 The greater diameter of an elliptical grass plot is 24 yards, and the less 17½ ; what will be the expense of gravelling a walk round it 4¾ feet wide, at 3½d. per square yard?

MENSURATION OF SOLIDS.

PROBLEM 1.

To find the solidity of a cube, or of a parallelopipedon.

1 Find the solidity of a cube whose side is 6⅕ feet.

2 Find the solidity of a parallelopipedon whose length is 20 feet, breadth 13 feet, and depth 6 feet 6 inches.

3 What is the solidity of a block of marble whose length is 9½ feet, breadth 4¼ feet, and depth 4⅓ feet?

4 Find the content of a chest 8 feet 6 inches long, 7 feet 9 inches wide, and 6 feet 3 inches deep ; and also the cost of painting it outside (except the bottom) at 4¼d. per square yard.

5 A cubical box contains 19⅛ cubic feet ; find the length of the diagonal of the side, and also of the diagonal of the box.

6 The length of a rectangular cistern within is 5 feet 3 inches, the breadth 3 feet 6 inches, and the depth 3 feet 3 inches ; how many gallons of water will it hold, and what will be the expense of lining it with lead at 3½d. per lb., the lead being 7 lb. to the square foot?

7 The solidity of a parallelopipedon is 427·546 feet, and the area of its end is 36⅕ feet ; what is its length?

8 Find the difference in the solidities of two cubical stones; in the one case the diagonal of the side is 30 inches, and in the other the breadth of the stone is 30 inches.

9 The length of a parallelopipedon is 12⅓, its breadth 7, and its depth 4¾ feet; what will be the area of the end of a similar parallelopipedon whose solidity is 4½ times as great?

10 A block of stone is 1 foot 9 inches broad, and 17 inches thick; how far from the end must it be sawn asunder so that the part cut off may contain exactly 7½ cubic feet?

PROBLEM 2.

To find the surface or solidity of a prism or a cylinder.

1 A square pillar measures 2 feet 6 inches in width, and 9 feet 6 inches in length; what is its solidity?

2 Find the solidity of a triangular prism, whose length is 16½ feet, and one side of its equilateral end 2⅕ feet.

3 What is the solidity of a hexagonal prism, one of the equal sides of its base being 1 foot 6 inches, and the length of the prism 12¼ feet?

4 The gallery of an assembly room is supported by 12 octagonal pillars, the height of each being 14 feet, and one side of the base of each 11 inches; supposing them to be prisms, what is the solidity of the whole, and what would be the expense of graining them at 3½d. per square yard?

5 Find the solidity of a cylinder whose height is 5½ feet, and the radius of its base 10½ inches.

6 The diameter of a garden roller is 15¼ inches, and its length 5 feet 8 inches; find its solidity.

7 If a round pillar, 7 inches across, have 4 solid feet of stone in it; what is the diameter of that column of equal length that contains 12 times as much?

8 The outer circumference of a circular vessel is 44 inches, and the thickness of the wood is ¾-inch, its height is 26 inches; how many gallons will it contain?

9 The length of a piece of square timber is 13⅓ feet, and its solidity is 57¼ feet; what will be its solidity when it is made into the greatest cylinder possible?

10 A cubic foot of brass is to be drawn into wire 1/10 of an inch in diameter; what will be the length of the wire allowing no loss in the metal?

PROBLEM 3.

To find the solidity or surface of a pyramid or a cone.

1 The height of a square pyramid is 14 feet 6 inches, and a side of its base measures 2 feet 3 inches; what is its solidity?

2 What will the repairing of a conical spire come to at 8½d. per square yard, supposing the perpendicular height to be 116¼ feet, and the diameter of the base 20⅞ feet?

3 The circumference of the base of a cone is 36 feet, and the slant height 9 feet 6 inches; what is its content?

4 Find the content of a pentagonal pyramid, its height being 13¼ feet, and the perimeter of its base 12½ feet.

5 Find the difference between the solidity of a square pyramid, whose height is 21 feet, and the diagonal of its base 32½ feet; and the solidity of a cone of the same height, and the same perimeter of the base as the pyramid.

6 Find the difference in the surfaces of the two figures mentioned in the last question.

7 Find the difference between the solidity of a hexagonal pyramid, whose height is 19½ feet, and a straight line from the middle of one of the sides of its base, to the middle of the opposite one 17½ feet; and the solidity of a pentagonal pyramid, the side of whose base and the height are exactly equal to those of the hexagonal pyramid.

8 Find the difference between the surfaces of the two figures mentioned in the last question.

PROBLEM 4.

To find the solidity or the surface of the frustum of a pyramid or of a cone.

1 What is the solidity of the frustum of a hexagonal pyramid, the side of the greater end being 4½ feet, the side of the less end 2¾ feet, and the height 10½ feet?

2 What is the solidity of the frustum of a cone, the diameter of the greater end being 6¼ feet, that of the less end 3¾ feet, and the height 10 feet?

3 Find the difference between the surfaces of the two figures mentioned in the last two questions.

4 What will the middle frustum of a cone cost at 11s. 6d. per solid foot, the radius of the greater end being 2¼ feet, that of the less end $1\frac{1}{16}$ foot, and the length of the slant side 8½ feet?

5 At Alexandria is a fine column, whose perpendicular height is 90 feet, the diameter of its base 9 feet, and the diameter at the top 7½ feet; what is its solidity, and also its superficial content?

6 How many cubic feet are there in a ship's mast whose length is 68½ feet, and the diameters of its ends 1⅛ foot and 2 feet?

The top diameter of a limekiln is 14 feet 7 inches, the bottom diameter 4½ feet, and the slant height (inside) is 22 feet 9 inches; how many bushels of lime will it burn at once, allowing 2218·19 cubic inches to a bushel?

PROBLEM 5.

To find the solidity of a wedge.

1 Find the solidity of a wedge, the length of whose base is 25 inches, the breadth 14½ inches, the length of the edge 14 inches, and the perpendicular height 2¼ feet.

2 Find the content of a wedge whose height is 13½ inches, the length of the edge 20 inches, the length of the base 30 inches, and the breadth 4¼ inches.

3 The length and breadth of the base of a wedge are 5 feet 6 inches, and 2 feet 9 inches, the length of the edge is 4 feet 6 inches, and the height 2 feet 11½ inches; find its solidity.

4 Find the solidity of a wedge, supposing the length and breadth of the base to be 4 feet 3 inches and 2¼ feet, the length of the edge 4 feet 10 inches, and the perpendicular height 5¼ feet.

5 The length and breadth of the base of a wedge are 6·35 feet and 3·275 feet, the length of the edge is 5⅛ feet, and its perpendicular height is $9\frac{1}{16}$ feet; what is its solidity?

PROBLEM 6.

To find the solidity of a prismoid.

1 The length of the greater end of a prismoid is 20 inches, and its breadth 10¼ inches, the length of the less end is 15 inches, and its breadth 8½ inches, the perpendicular height is 19⅛ inches ; what is its solidity?

2 The length and breadth of a fish pond at the top are 150 and 80½ yards, the length and breadth at the bottom are 129 and 61¼ yards, the perpendicular depth is 10⅞ feet; what did it cost digging at 4¾d. per cubic yard?

3 The top widths of a railway cutting are 160 and 126 feet, their respective depths are 35 and 27½ feet, and the bottom width is 32½ feet throughout; find its content in cubic yards.

4 What is the content of a trough in the form of a prismoid, its bottom being 50 inches long, and 30 inches broad, and its top 4¾ feet long and 3⅞ feet broad, and its depth 3½ feet?

5 The ditch of a fortification is ⅓ of a mile long, 7½ feet deep, 18½ feet broad at the bottom, and 23 feet at the top: how many cubic yards were excavated from it.

PROBLEM 7.

To find the surface or the solidity of a sphere.

1 What is the solidity of a globe, whose circumference is 64 inches?

2 What is the convex surface of a globe, whose diameter is 26½ inches?

3 Supposing the ball at the top of a church spire to be 6¼ feet in diameter; what is its solidity, and what would it cost gilding at 2½d. per square inch?

4 How many square inches of gold leaf would gild a ball 1¼ foot in diameter?

5 What is the solidity of a globe whose diameter is 6 feet 6 inches?

6 What is the solidity of a globe whose circumference is 17 feet 4⅕ inches?

7 Find the content and weight of an ivory ball 3¼ inches in diameter, supposing a cubic foot of ivory to weigh 1820 ounces.

8 If a 3-inch cube of ivory be turned into a sphere of the same diameter, what weight of ivory will be lost?

9 The solidity of a cannon ball is 119·7156 inches; what is its circumference?

10 The solidity of the moon is 5424617475·2 miles; find her diameter.

PROBLEM 8.

To find the solidity of a segment of a sphere.

1 If the circumference of a sphere be 10 feet 3 inches, what is the solidity of a segment whose height is 17½ inches?

2 The radius of the base of a segment of a sphere is 8¼ inches, and the height 5½ inches; find its solidity.

3 The diameter of the base of a spherical segment is 12·525, and its height 3·75; what is its solidity?

4 What is the solidity of a spherical segment whose height is 9, and the diameter of its base 21⅜?

PROBLEM 9.

To find the solidity of the frustum or zone of a sphere.

1 Find the solidity of a zone whose greater diameter is 10 feet 6 inches, less diameter 7 feet 3 inches, and its height 4 feet 9 inches.

2 What is the solid content of a zone whose greater diameter is 21½ inches, its less diameter 17 inches, and its height 11¾ inches?

3 Find the solidity of the middle zone of a sphere whose top and bottom diameters are each 4½ feet, and the breadth of the zone 5¼ feet.

4 A cask is in the form of the middle zone of a sphere, its top and bottom diameters being each 6 feet, and its height 5½ feet inside; how many gallons will it hold?

5 What is the content of a spherical zone, the diameters of its ends being 12½ and 14¼ inches, and its height 3½ inches?

PROBLEM 10.

To find the solidity of a circular spindle, or of the middle frustum of a circular spindle.

1 The length of a circular spindle is 20 feet, and its middle diameter 16 feet; find its solidity.

2 The length of a circular spindle is 5½ feet, and its middle diameter 2¼ feet; what is its content?

3 A cask is in the form of the middle frustum of a circular spindle, its head diameter being 14 inches, its bung diameter 18 inches, and its length 22½ inches; how many gallons will it hold?

4 Find the solidity of the middle frustum of a circular spindle whose length is 45, greater diameter 33½, and less diameter 28⅕ inches.

PROBLEM 11.

To find the surface or the solidity of a cylindrical ring.

1 What is the solidity of an iron ring whose inner diameter is 25 inches, and its thickness 6½ inches?

2 The thickness of a cylindric ring is 3½ inches, the inner diameter 13½ inches; what is its solidity and also its convex surface?

3 What is the solidity of an anchor ring whose inner diameter is 9 inches, and the thickness of the metal 3½ inches?

4 What is the surface of a ring, the inner diameter being 17, and the thickness 4½ inches?

5 Find the solidity of a cylindric ring, whose inner diameter is 14 and its outer diameter 17½ inches.

6 What is the surface of a cylindric ring whose thickness is 5½, and the inner diameter 21 inches?

PROBLEM 12.

To find the solidity or surface of a regular body.

1 Find the solidity and surface of each of the five regular bodies, supposing the linear edge of each to be 6 inches.

2 Find the solidity and surface of each of the five regular bodies, supposing the linear edge of each to be 4½ inches.

3 Find the solidity and the surface of each of the regular bodies, supposing the edge of each to be 2.

4 What is the solidity of a tetraedron, whose linear edge is 3?

5 What is the solidity of a hexaedron, whose linear edge is 2½?

6 Find the superficial content of an octaedron, whose edge is 2½.

EXERCISES TO THE END OF MENSURATION.

F.

1 In a square piece of ground which cost £551. 5s., at 52½ guineas per acre, a circular lake was made, with a walk 6 yards wide around it, touching each side of the square; find the area of the lake and also of the walk.

2 If a beam of timber 20 inches wide, 16 inches deep, and 10 feet 6 inches long, weigh 16 cwt. 2 qrs., what will be the length of another beam weighing 2 tons, the side of whose square end measures 2 feet?

3 How many three inch cubes are there in a block of marble, 12 feet long, 10 feet broad, and 7 feet thick; and what is the value of each cube, if the whole block be worth £588?

4 How many yards of canvass will be required for a conical tent whose height is 9½ feet, and the diameter of its base 14½ feet?

5 The area of a garden in the form of an isosceles triangle is 7494·64 yards, and the base is 209½ yds.; what will the garden cost fencing at 5½d. per yard?

6 A gentleman has a bowling green 450 feet long, and 360 feet broad, which he wishes to raise 1¼ feet higher by means of the earth to be dug out of a ditch, with which he intends to surround it; find the depth of the ditch, if its uniform breadth be 9½ feet.

7 In a block of wood a hole is made twenty inches long, and one square inch in section; if the largest possible cylinder be placed in the hole how much space will be unoccupied?

8 A person receives an order for two mahogany tables, one square and the other round, to contain an equal number of feet, the diagonal of the square one is 8·5 feet; what is the circumference of the round one, and the cost of both at 2s. 10½d. per square foot?

9 I have a field in the form of a right-angled triangle, and I wish to divide it by a fence made perpendicular to the hypothenuse from the angle; the lengths of the sides containing the right-angle are 960 and 1500 links. Find the cost of the fence at 1s. 3½d. per yard.

10 What must be the diameter of the bore of a cannon, which is cast for an iron ball 36 lbs. in weight, so that the diameter of the bore may be ⅛ of an inch more than that of the ball?

11 What is the thickness of the lead in a pipe of an inch and a quarter bore, which weighs 16 lbs. per lineal yard, if a cubic foot of lead weigh 11325 ounces?

12 If a heavy sphere whose diameter is 4 inches be let fall into a conical glass full of water, whose diameter is 5, and height 6 inches; how much water will run over?

13 If the diameter of the earth be 7970 miles and that of the moon 2180 miles, find the ratio of their surfaces, and also of their solidities, supposing them to be globular.

14 Find the difference in the solidities of two cubical stones, in the one case the diagonal of the side is 40 inches, and in the other the diagonal of the stone is 40 inches.

15 If a sphere of copper, 1¼ foot in diameter, were to be beaten out into a circular plate $\frac{1}{20}$ of an inch thick, what would be its diameter?

16 A coppersmith proposes to make a flat-bottomed kettle in the form of a conical frustum, to contain 13·8827 gallons, the depth of the kettle to be 12 inches, and the diameters at the top and the bottom to be in the ratio of 5 to 3: find the diameters.

17 Find the thickness of the shell of a hollow sphere of copper, weighing 3½ lbs., so that being put into common water it may be just immersed by its own weight.

18 The diameter of a circular island is 350 feet, and it is surrounded by an oblique-sided moat, the breadth at the top being 11 feet, the breadth at the bottom 4½ feet, and its perpendicular depth 7¼ feet; what is the content of the moat?

19 Find the weight of a hollow sphere of cast iron, whose inside diameter is 10⅛ inches, and the thickness of the metal 1¾ inch.

20 A circular race-course encloses a space of 161⅛ acres, and the breadth of the course is 21½ yards; find the expense of railing it all round on both sides at 1s. 1½d. per yard, and also the area of the course.

London, April 7th, 1852.

21 Sold by order of William Thompson, for the Account, April 13th :—

£247. 17s. 6d., South Eastern Railway stock, at $77\frac{1}{8}$.
£479. 15s. 10d., North Midland ditto ...... $84\frac{7}{8}$.
£624. 16s. 7d., London & Brighton ditto...... $101\frac{5}{8}$.
Commission, $\frac{1}{8}$ per cent.

London, April 17th, 1852.

22 Sold by order of James Hamilton for the account, April 21st.

74 Ambergate Railway shares, at $7\frac{1}{16}$ per share.
59 Chester and Holyhead do. ... $21\frac{3}{8}$ ......
42 Thames Haven and Dock ... $3\frac{1}{16}$ ......
Commission $\frac{1}{8}$ per share.

London, April 19th, 1852.

23 Bought by order of William Lonsdale, Esq., for the account, 30th inst.

14,700 Dol., United States 4-per-cent. stock, at $117\frac{1}{8}$; Exchange, 4 dol. 75 c. per £ sterling.
12,500 Francs, 4-per-cent. French stock, at $105\frac{4}{5}$; Exchange, 25 fr. 20 c. per £ sterling.
17,000 Thalers, Prussian 4-per-cent. bonds, at $91\frac{1}{16}$; Exchange, $6\frac{2}{3}$ per £ sterling.

Sheffield, August 1st, 1857.

24 Messrs. Abraham and Bowling.

Bought of Shepherd & Co.

17 hhds. of sugar, Tare as stated, Draft 2 lbs. per 3 cwts. in each.

Hhds.	*Cwt.*	*Qr.*	*Lb.*	*Tare.*		*s.*	*d.*	
3 each,	11	1	17...	$14\frac{1}{2}$ lbs.	per cwt.,	at 35	7	per cwt.
5 each,	13	2	21...	15	......	at 32	$10\frac{1}{2}$	......
4 each,	12	3	$13\frac{1}{2}$..	12	......	at 33	$11\frac{1}{2}$	......
5 each,	13	1	$19\frac{1}{2}$..	13	......	at 34	7	......

Discount, $7\frac{1}{2}$ per cent. for cash.

Kingston, Jamaica, April 7th, 1856.

25 Messrs. Jones, Lloyd, and Co.

Bought of Simpson and Sons.

43 bags of West India cotton, as under :—

		Cwt.	*Qr.*	*Lb.*	*Tare*			*d.*	
10	bags, each	2	1	19	...5¼	lbs. per bag,	at	9½	per lb.
7	......	2	3	11	...5½	......	at	9¼	...
4	......	3	1	17½	..6¼	......	at	10⅛	...
9	......	2	1	12¼	..5¾	......	at	10¼	...
7	......	3	2	24	...5½	......	at	9¾	...
6	......	2	3	17¼	..6½	......	at	7¾	...

Paris, November 11th, 1856.

26 Messrs. Robinson and Fleming.

Bought of G. Plisson.

4 Puncheons cognac, contents 357 gallons, at 117 francs 70 cents per hectolitre of 22 gallons.

3 Hhds. superior cognac, contents 249 gallons, at 137 francs 75 cents per hectolitre.

7 Bales of Italian silk, each weighing 117 kilogrammes, at 16 francs 25 cents per kilogramme.

Exchange, 24 francs 97½ cents per £ sterling.

Leipsic, August 19th, 1854.

27 Messrs. Thompson and Williams.

Bought of Pfeiffer and Co.,

5 Bales of merino wool, No. 17 to 21.

No. 17,	1 centner,	47 lbs.,	at 2s. 4½d.	per lb. English.
No. 18,	1	34 ...	at 2s. 1⅛d.	......
No. 19,	1	41 ...	at 1s. 11¾d.	......
No. 20,	1	64 ...	at 2s. $0\frac{1}{16}$d.	......
No. 21,	1	55 ...	at 2s. 3⅜d.	......

1·03 lbs.=1 lb. Saxon.
110 lbs.=1 centner.

Constantinople April, 7th, 1854.

28 Messrs. Wilkinson and Armstrong.

Bought of Williams Brothers.

		Piastres,	*Paras.*	
179 Okes Turkey rhubarb,	at	21	17	per oke.
417	at	20	37	...
246	at	23	19	...
117	at	19	27	...

Exchange, 110 piastres per £ sterling.
40 paras=1 piastre.

London, July 7th, 1858.

29 Bought by order of Goldsmid and Co., for the account, July 10th.

£1474. 17s. 6d. 3-per-cent. consols, at 101⅛.
£1749. 10s. 0d. 3¼-per-cent. annuities, at 102⅞.
£796. 15s. 0d. Bank stock, at 217⅜.
£2149. 12s. 6d. 3-per-cent. reduced, at 101⅛.
Commission, $\frac{1}{16}$ per cent.

London, March 19th, 1854.

30 Sold by order of Henry Watson, Esq., for the account, March 30th.

£247. 16s. 8d. East Lincoln Railway stock, at 107½.
£473. 15s. 6d. North Midland .... at 84⅛.
£649. 10s. 0d. York and Berwick............ at 70¼.
£574. 17s. 6d. Great Northern .... at 157⅜.
Commission, ⅛ per cent.

31 A reservoir measures 150 inches in length, 119 in breadth, and 94 in depth; how long would a person be emptying it by means of a pump, supposing him to make 40 strokes every minute and a half, and to lift 3½ pints of water every stroke?

32 The diameter of a circular island is 317 feet, and it is surrounded by an oblique-sided moat, whose breadth at the top is 22 feet, at the bottom 14½ feet, and the perpendicular depth 10½ feet: what would be the expense of excavating the moat at 1s. 10½d. per solid yard; and how thick would the soil lay upon the island if the whole which was brought out of the moat were spread equally upon its surface?

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